ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

JULY 1954

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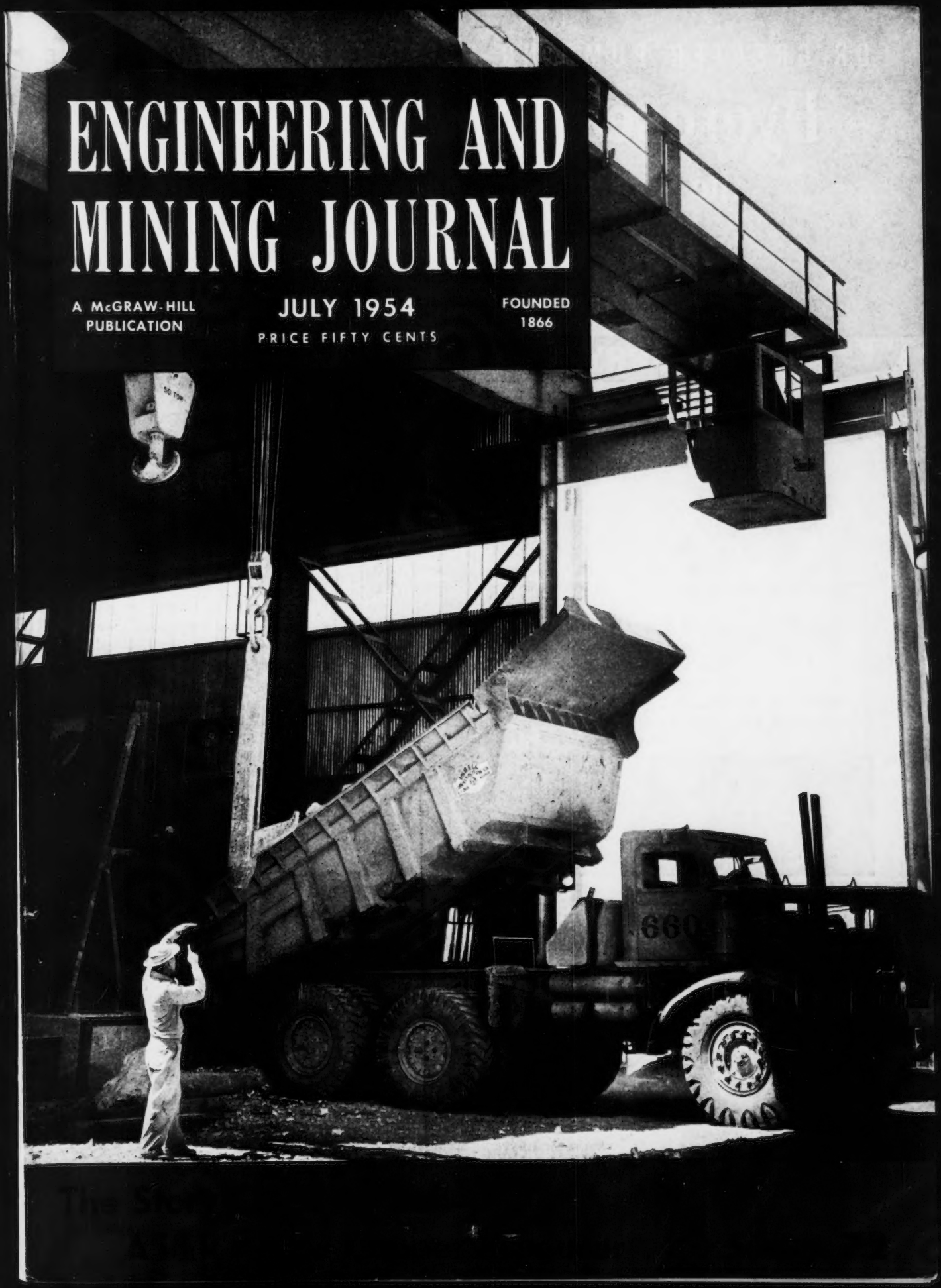
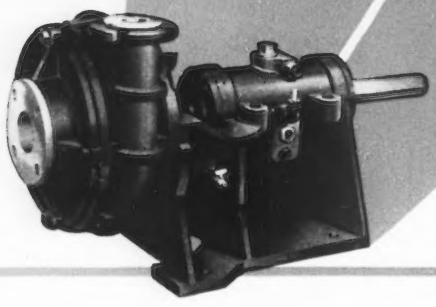


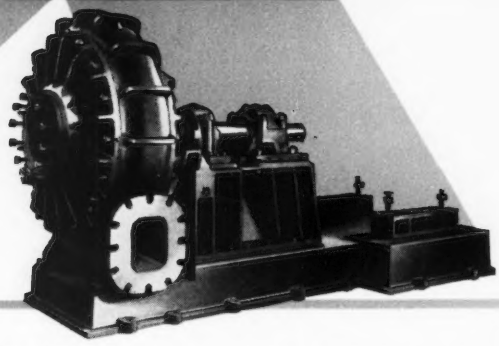
FOR GREATER PUMPING EFFICIENCY AND ECONOMY

Hydroseals are adapted to

the size of your abrasive material

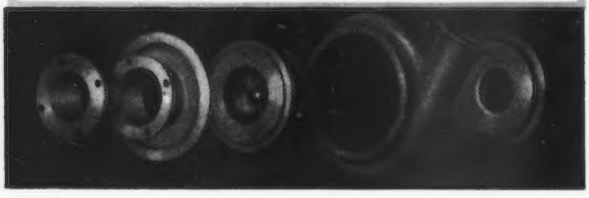
400 to 48 MESH 100% minus .0116"	35 to 4 MESH 100% minus ¼"	3 MESH—.263" and larger to 6"
SLURRY	SAND	DREDGE

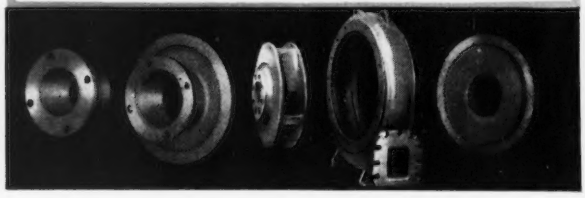




Because abrasives up to ¼" diameter bounce off resilient Maximix Rubber, Hydroseal Slurry and Sand Pumps have the advantage of replaceable parts that outlast metal 4 to 6 times. Moulded to lock into position mechanically, Maximix Rubber parts are easily handled. Weighing 80% less than their equivalents in metal, they are inexpensive to ship.

Because abrasives over ¼" diameter have a tearing action against even tough Maximix Rubber, every Hydroseal Dredge Pump has its impeller, shell and suction sleeve specially made of the alloy most resistant under the wearing conditions. However, according to duty, the stationary side plates can be Maximix Rubber protected.





Because a flow of seal liquid prevents enlargement of the critical clearances, all Hydroseal Pumps maintain their initial high efficiency up to the moment an abrasive-worn part needs replacement. You never need an oversize Hydroseal and motor as allowance for wear.

Write for Hydroseal Catalog No. 953

THE ALLEN-SHERMAN-HOFF PUMP CO.

Dept. B—259 E. Lancaster Ave., Wynnewood, Pa.

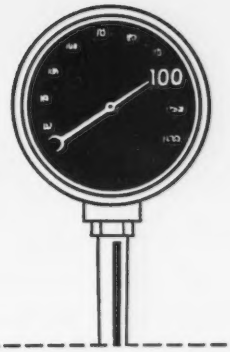
Representatives throughout the World

HYDROSEAL and CENTRISEAL

SAND, SLURRY & DREDGE PUMPS

MAXIMIX RUBBER PROTECTED

keeping air pressure UP THOUSANDS of feet DOWN



At the Silver Summit Mine in Osburn, Idaho, in a vaulted room more than 1,000 feet below the surface, an Ingersoll-Rand PRE compressor (shown below) converts electric power into air power used to help tear silver, copper and lead ores from the earth.

This spic and span installation, shown below, is reached through a tunnel 6,000 feet long. The 400-hp compressor provides air for mine workings as far as 3,400 feet below it.

Placing the compressor underground has two advantages: First, it eliminates costly piping that otherwise would be necessary to transmit compressed air more than a mile from a surface plant to the working shaft. Second, it avoids air pressure losses that would be caused by leakage and the friction of air passing through a mile-long pipe.

This is not the first underground PRE installation for the Hecla Mining Company whose management controls the operation of Silver Summit Mining Co. It had previously relocated one unit at its Star Mine from the surface plant to an underground station where it also installed a new PRE. This step eliminated the surface plant and the pressure losses formerly caused by 11,000 feet of air piping. Several other I-R compressors have been serving Hecla's older properties for more than 30 years.

Long recognized as a leader in using modern mining equipment to increase production, Hecla mines employ many Jackhamers, drifters, Jackbits, hoists, pumps, and other I-R products.

861-1

FEATURES OF THE "PRE" COMPRESSOR

- Crankcase need not be opened for bearing adjustments . . . stays clean.
- Main bearings have micrometer adjustment from outside of crankcase.
- Full-floating crankpin and crosshead-pin bearings result in long bearing life.
- Unique, built-in, force-feed running gear lubrication eliminates piping both inside and outside compressor.
- I-R stainless-steel Channel Valves are efficient and durable.
- Automatic 5-step full Clearance Control regulates compressor output.
- Built for continuous full-load operation . . . for air or any gas . . . for any pressure . . . sizes from 300 to 3000 hp.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

ENGINEERING AND MINING JOURNAL

88th YEAR OF PUBLICATION

VOL. 155 NO. 7

JULY 1954

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LETTERS

African Ferro-Chrome

SIR:

In the February 1954 issue *(E&MJ, p 102)* reference is made to the new ferro-alloy plant of Rhodesian Alloys Ltd. at Gwelo, S. Rhodesia. It is stated that the first ferro-chrome to be made in Africa was shipped ex these works to American and British steel companies.

I would point out that this corporation has been operating a ferro-alloy plant at Vereeniging, Transvaal, since 1942, and in addition to exporting ferro-chrome has met in full the local demand in the Union for this alloy as well as such alloys as ferro-silicon, ferro-manganese, silico-manganese, etc.

T. H. LEE, *Commercial Manager, African Metals Corporation Ltd. Johannesburg, South Africa*

Here's Janet

Ed: In the April issue of E&MJ (p.4) we published a letter from a young lady who requested "information on rocks," and added her name and address, Janet Frances Cameron (25 Magerus St.) Huntington Station, Long Island, N.Y. Within a week of publication, we heard that Janet was receiving "rocks" from a number of E&MJ readers. She is shown above with part of her collection and the letters she received.

We think it's rather unusual for readers of a technical magazine, all busy with their own problems and "rocks," to take time out for such a spontaneous and generous gesture. Frankly, we're pretty proud of our readers and wonder how many of them, like Janet, got interested in mining through an early curiosity about "rocks".

South African Future

SIR:

Almost every newspaper I have read since my return to the U.S. (from the

(Continued on p 102)

B. F. Goodrich Grommet belts last 20 to 50% longer, yet cost no more than ordinary V belts

Save 3 ways

Here's how you can make a 3-way saving with B. F. Goodrich Grommet V belts. First, you save on replacement costs because Grommet V belts last 20 to 50% longer. You save on production costs because machines keep running with fewer interruptions. And you save on maintenance costs because these V belts need less attention. Here are the basic reasons BFG Grommet belts outlast and outperform ordinary V belts.

Strongest V belt made

All of the load-carrying cords in Grommet belts are concentrated in twin grommets. These grommets are cord loops, made like giant twisted cables except that they're endless. Since there are no center cords, the Grommet belt is more flexible, and so can "give" temporarily and absorb shock loads. As a result, Grommet belts last 20 to 50% longer, depending on the service. (The more severe the service, the greater the increase over ordinary belts.)

No weak spots

The section where cords overlap is the weak spot in ordinary belts. That's where 80% of V belt failures occur. But in Grommet V belts this cause of belt failure has been eliminated. The grommets are endless. There are no splices or overlaps—no weak spots to cause premature belt failures.

⅓ more grip

Grommet V belts have more rubber in relation to belt size. Without any stiff overlap, they're more flexible, grip sheaves better. Size for size, Grommet belts give ⅓ more gripping power with less slip, pull heavier loads with a higher safety factor. And because there is less slip, there is also less surface wear.

Less stretch

In ordinary belts under tension, the center cords loaf, the outer cords overwork because tension is greater near the driving faces. Grommet belts. with no center cords, have much more strength and less stretch. Grommet belts stretch, on an average, only about ⅓ as much as ordinary belts.

They cost no more

Grommet V belts were developed by B. F. Goodrich to give V belt users more for their money. No other belt will stand so much punishment or last so long. Yet the savings they can make for you will be clear profit because Grommet belts cost not one cent more than ordinary V belts.

Send for proof today

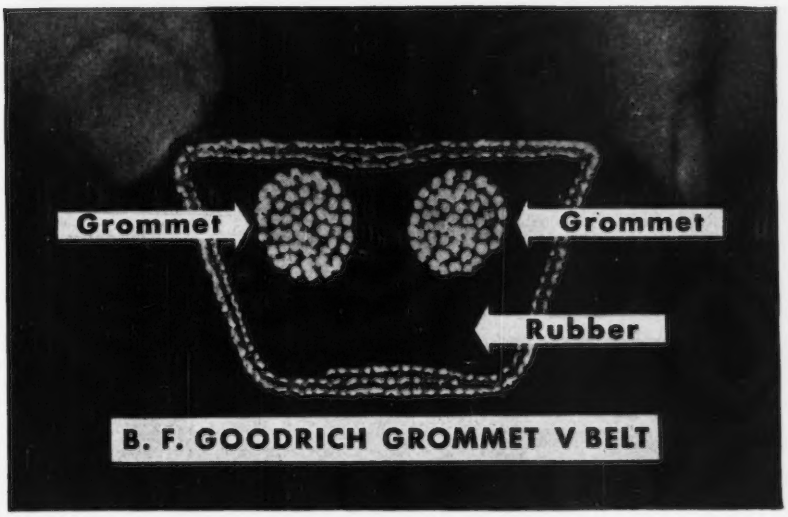
Ask your local B. F. Goodrich distributor or send the coupon for a set of reports telling users' experiences and showing actual installations where Grommet V belts have outlasted all others.

Grommet—T. M. The B. F. Goodrich Co.

Grommet V-Belts BY

B.F.Goodrich

INDUSTRIAL PRODUCTS DIVISION



The B. F. Goodrich Company
Dept. M-276
Akron, Ohio

☐ Send set of reports telling users' experiences and showing actual installations proving that B. F. Goodrich Grommet belts outlast all others.

☐ Have distributor show me the "X-ray" belt so I can see Grommet belt construction.

Name_____

Firm Name_____

Address_____

City_____ Zone____

State_____

How to make ROPE LAST

USE *Texaco Crater*—the lubricant that keeps rope strong longer. It quickly penetrates to the core, surrounding and preserving the hemp. Simultaneously, it coats the strands with a tough lubricating film that lasts and lasts. *Texaco Crater* protects rope against both wear and rust, brings down maintenance costs.

On open gears, *Texaco Crater* will also reduce maintenance costs. Its clinging, long-lasting film absorbs shocks, muffles noise and minimizes wear.

For both applications you may prefer the added convenience of *Texaco Crater X Fluid.* It *goes on* as a liquid, *stays on* as a persistent, protective film just like the regular *Texaco Crater.*

In mine car wheels, use *Texaco Olympian Grease.* You'll assure easier starts and get longer lasting protection for all types of wheel bearings.

Let a Texaco Lubrication Engineer help you use effective lubrication to get greater efficiency and reduce your costs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

For over 20 years more copper ore has been mined in the U.S. with Texaco-Lubricated equipment than with any other

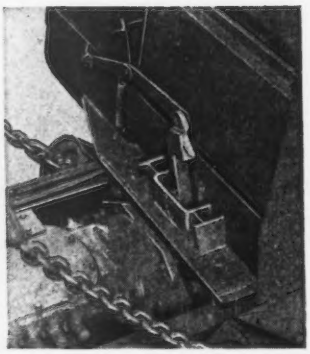
TEXACO

TEXACO

Lubricants and Fuels

FOR THE MINING INDUSTRY

GRAVITY DUMP



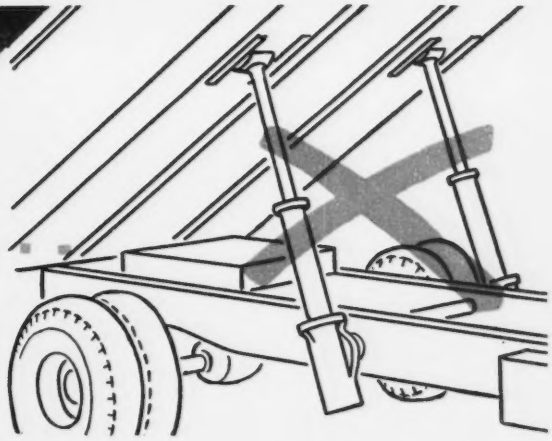
SIMPLE BODY RELEASE LEVER WORKS *INSTANTLY*

1 Body release lever is located in cab to left of steering wheel. Lever engages toggle linkage to latch hook on chassis . . .

2 Trip rod instantly releases latch hook from body latch seat on the tilting Dumptor body. Gravity dumps load instantly as . . .

3 Body rolls on heavy-duty rockers. Snub chains attached to big coil spring shock absorbers check body at 70-degree tilt.

eliminates body hoists.....



Koehring Dumptors®

have no slow-working body hoists. Operator trips the body-release lever . . . and gravity dumps the 6-yard load in just one second. It's as simple as that!

Saves 20 seconds every time you dump Because there is no waiting for slow-raising body hoists, one-second dumping saves 15 to 25 seconds dump-time on every cycle. This gives you more productive haul-time . . . earns an important increase in extra yards per hour.

Never balks . . . never wears out . . . There are no expensive hoist replacement parts, hoist maintenance or down time to eat into your profits. Koehring gravity dump is always instantaneous, trouble-free in all temperature extremes . . . never balks . . . never wears out.

No spring maintenance is another money-saving Dumptor advantage. There's just one big, double-coil chassis spring on steering axle, none on driving axle. Big shock-absorbing drive tires eliminate need for more springs . . . save spring maintenance time and replacement costs.

Check your body hoist and spring maintenance costs for a year. See how much you'll save when you haul with Koehring heavy-duty Dumptors. Get all the facts from your Koehring distributor soon . . . or write us for 28-page Dumptor catalog.

KOEHRING COMPANY

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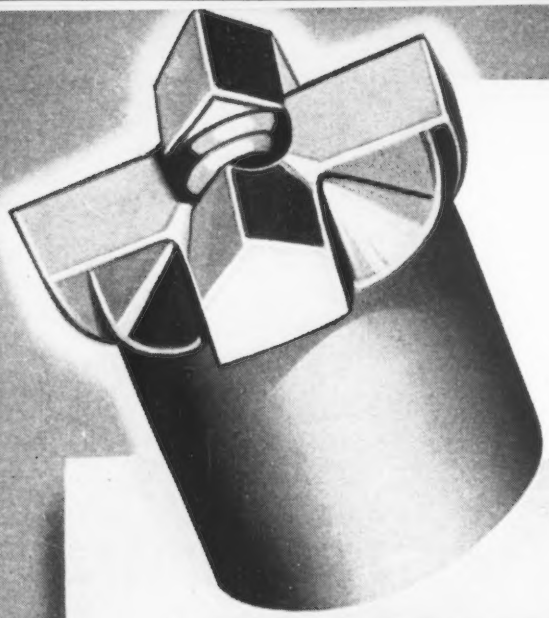
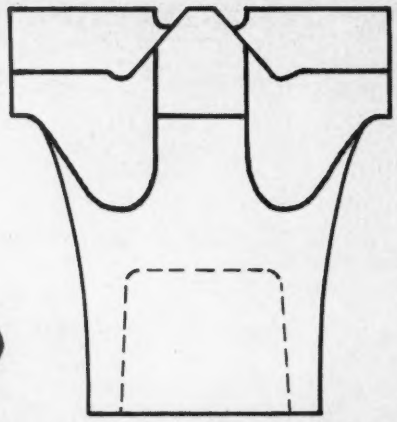
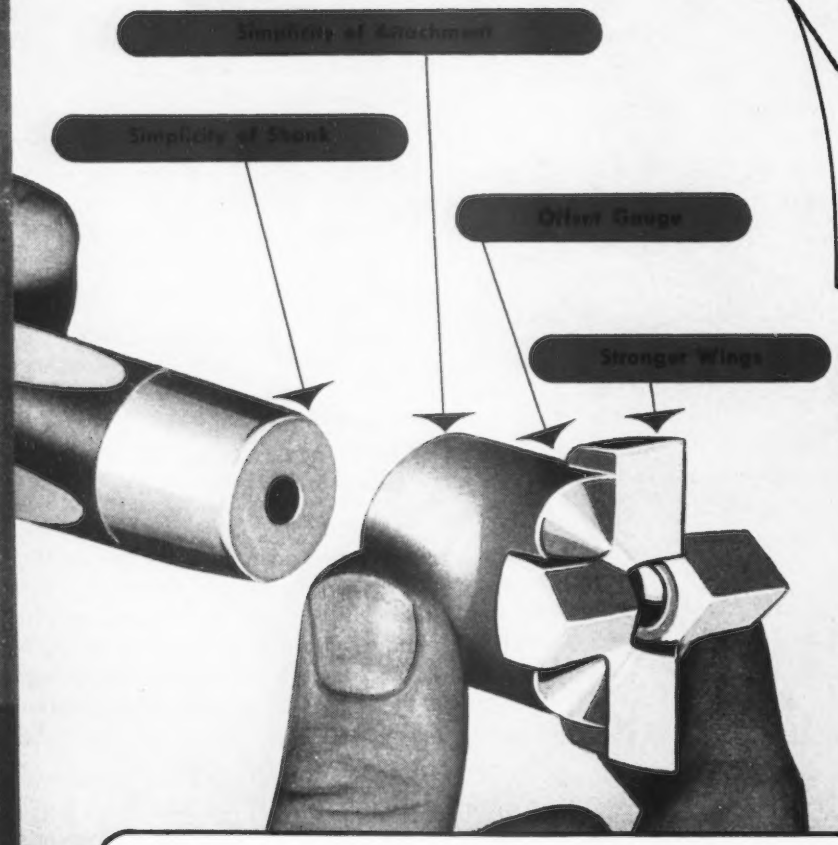
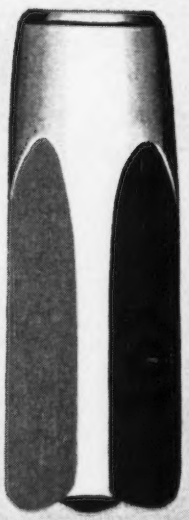
K341

Here's another









The union of the bit and the rod after drilling has a cohesive strength of several tons . . . A sharp blow of sufficient weight on the end of the bit skirt will serve to detach the bit from the rod.

SPECIFICATIONS

Mines everywhere cut drilling costs with CRD DETACHABLE DRILL BITS • 4 - Wing Type - Center Hole - Side Hole

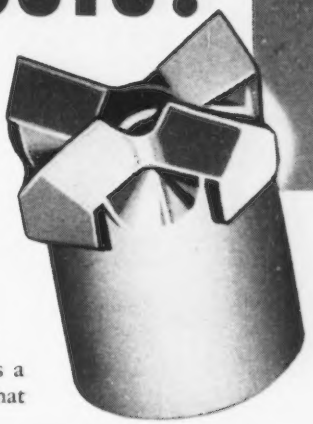
Class "A" Bits		
For class "A" drill steel connection on any steel. Best suited to ⅞" steel.	1-1/4	Aluminum
	1-5/16	Pink
	1-3/8	Deep Green
	1-7/16	Brown
	1-1/2	Grey
	1-9/16	Maroon
	1-5/8	Deep Blue

Class "B" Bits		
For class "B" drill steel connection on any steel. Best suited to 1", 1⅛" and 1-¼" steel.	1-7/16	Orange
	1-1/2	Green
	1-9/16	Yellow
	1-5/8	White
	1-11/16	Black
	1-3/4	Red
	1-13/16	Blue
	1-7/8	Tan
	1-15/16	Plain
	2	Pink
	2-1/8	Maroon
	2-1/4	Aluminum

Cans are labeled showing size of steel socket, gauge of bit, and color.

way to cut drilling costs!

Use Le Roi-CLEVELAND one-use CRD Detachable Bits



Lower cost per foot of hole — that's the goal of everyone who has rock to drill. And that was the goal of Le Roi-CLEVELAND engineers, too. They didn't fool around with the problem either. Fifty years of experience in designing rock drills was put to work. The result — a one-use detachable bit that can save you money in a wide variety of applications.

This designing job wasn't done overnight. You can't produce the results our engineers were after in such a short time. Instead, these bits were put to work—and, for a number of years they have helped reduce drilling costs materially in mines, in quarries, and on construction jobs.

That's why we offer them to you now — with complete confidence in their ability to help you improve your rock-drilling cost picture.

These Features Mean Lower Drilling Costs for You

Faster Drilling Speed — Special offset gauge feature, which permits the use of thinner wings and a steeper reaming angle, greatly reduces binding and provides ample clearance for cuttings. Result is a free, fast-cutting chiseling action that gives you greater drilling speed.

Less Drill-Steel Breakage — The method of attachment used with the CRD bit eliminates threads on the drill rod. Since a drill rod is only as strong as the root diameters of its threads, the tapered threadless CRD design provides longer drill-steel life — reduces drill-steel handling and reconditioning costs.

Lower Rock Drill Repair Costs — Because the CRD bit design reduces binding in the hole, there is less strain on the rotation parts of your rock drills. Rifle bars, rifle nuts, and chucks last longer. You get more drilling done at lower cost.

Since no special equipment is needed to thread rods, you owe it to yourself to try a can of CRD bits. They're ideal for roof bolting and for use in your stopes as well as in your headings. A short trial will give you first hand information on the ability of these bits to cut drilling costs in your property as they have in so many others.

Bulletin RD-29 gives detailed information. A copy is yours for the asking — just write for it. RD-58

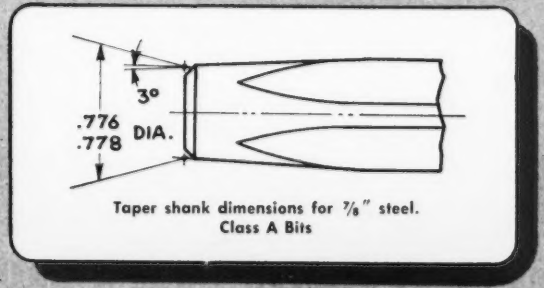
CLEVELAND ROCK DRILL DIVISION

Le Roi Company

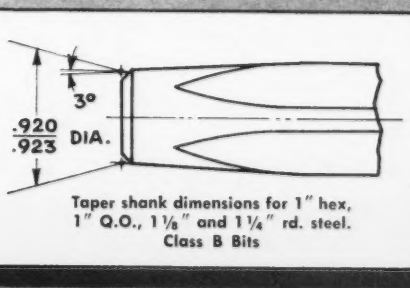
A Subsidiary of Westinghouse Air Brake Co.

12500 BEREA ROAD • CLEVELAND 11, OHIO

Plants: Milwaukee, Wis. • Cleveland — Greenwich — Dunkirk, Ohio • Coldwater, Mich.



Taper shank dimensions for ⅞" steel.
Class A Bits



Taper shank dimensions for 1" hex,
1" Q.O., 1⅛" and 1¼" rd. steel.
Class B Bits

The taper attachment shank used with the CRD bit is easy to make. You need no dies or other expensive threading equipment. Several simple, low-cost methods can be used for preparation — grinding, forging or machining.

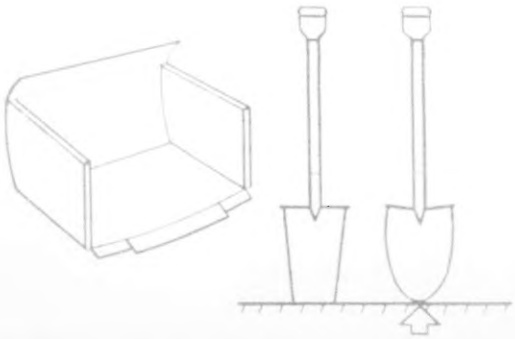
Compare these dirt-

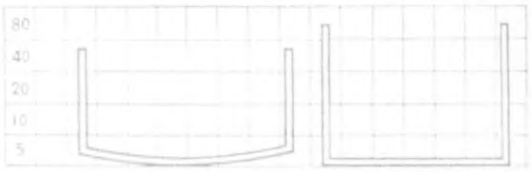
PENETRATES FASTER

Curved and offset cutting edge on Allis-Chalmers Motor Scrapers concentrates all the horsepower on the center section during initial penetration. The penetrating ability of a round-end spade helps illustrate the practical soundness of this Allis-Chalmers design.

LOADS FASTER

Low, wide bowl plays an extremely important part in ease of loading. Tests have proved that loading resistance is largely determined by the height to which the load is built. New dirt entering the bowl must lift the load directly above it in order to make room for itself.

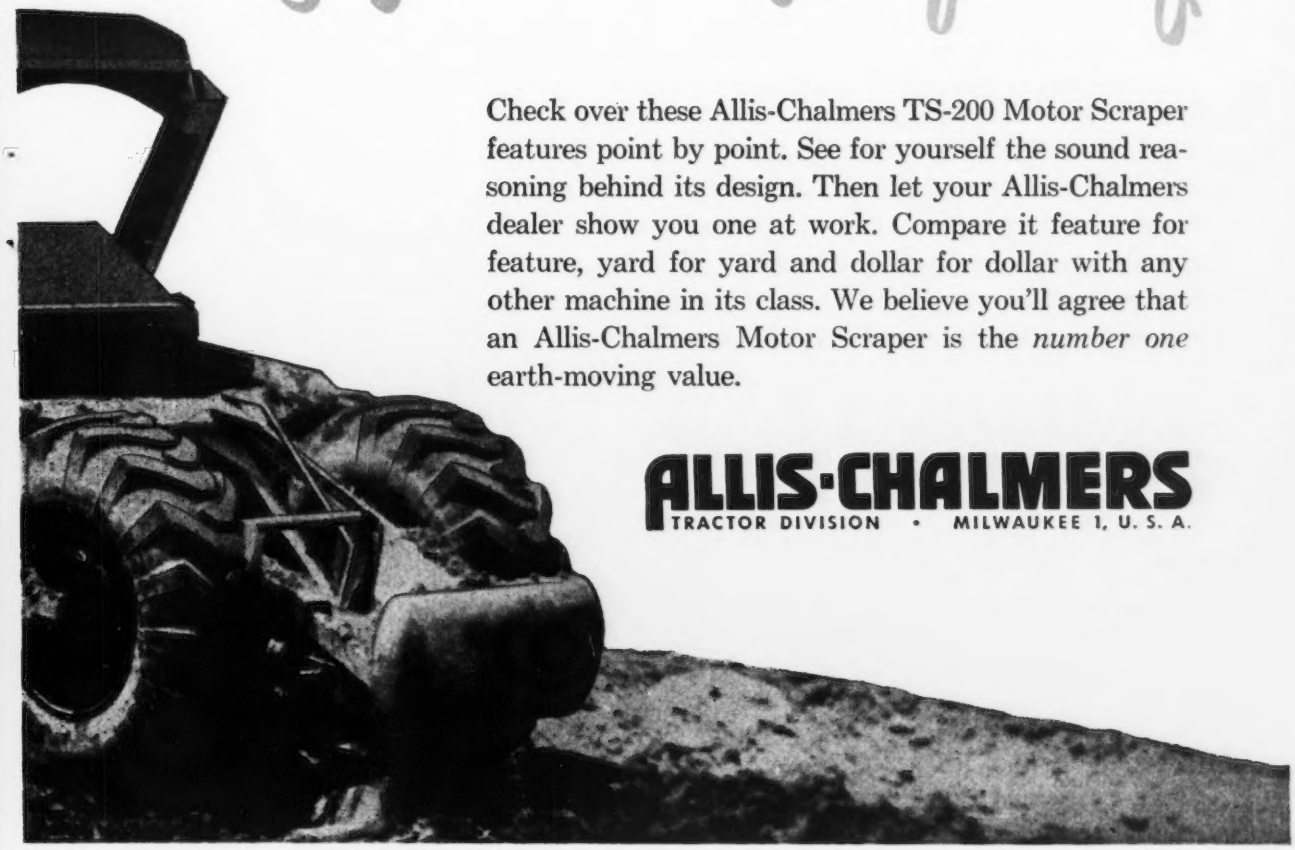




This chart shows how loading resistance continually increases as the load builds up . . . how the lower, wider bowl of an Allis-Chalmers Motor Scraper requires less time and power to get the same yardage.

PERFORMANCE MAKES DOLLARS

moving features before you buy

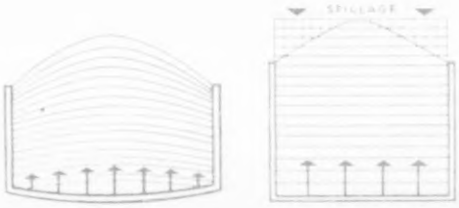


Check over these Allis-Chalmers TS-200 Motor Scraper features point by point. See for yourself the sound reasoning behind its design. Then let your Allis-Chalmers dealer show you one at work. Compare it feature for feature, yard for yard and dollar for dollar with any other machine in its class. We believe you'll agree that an Allis-Chalmers Motor Scraper is the *number one* earth-moving value.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

HEAPS AUTOMATICALLY

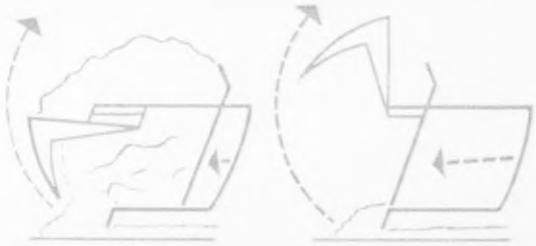
The combination of slightly deeper center cut and correctly angled cutting edge shapes the load as the scraper fills. The greater volume of dirt flowing into the center of the bowl "boils" forward, to the rear and to the sides, producing an automatically heaped load without excessive spillage.



These diagrams show how an automatically heaped load avoids costly spillage even though the center is built up above the sides of the bowl.

SPREADS EVENLY

Forward movement of ejector is timed with lifting action of apron, which provides a continuous flow of material to insure a smooth, even spread.

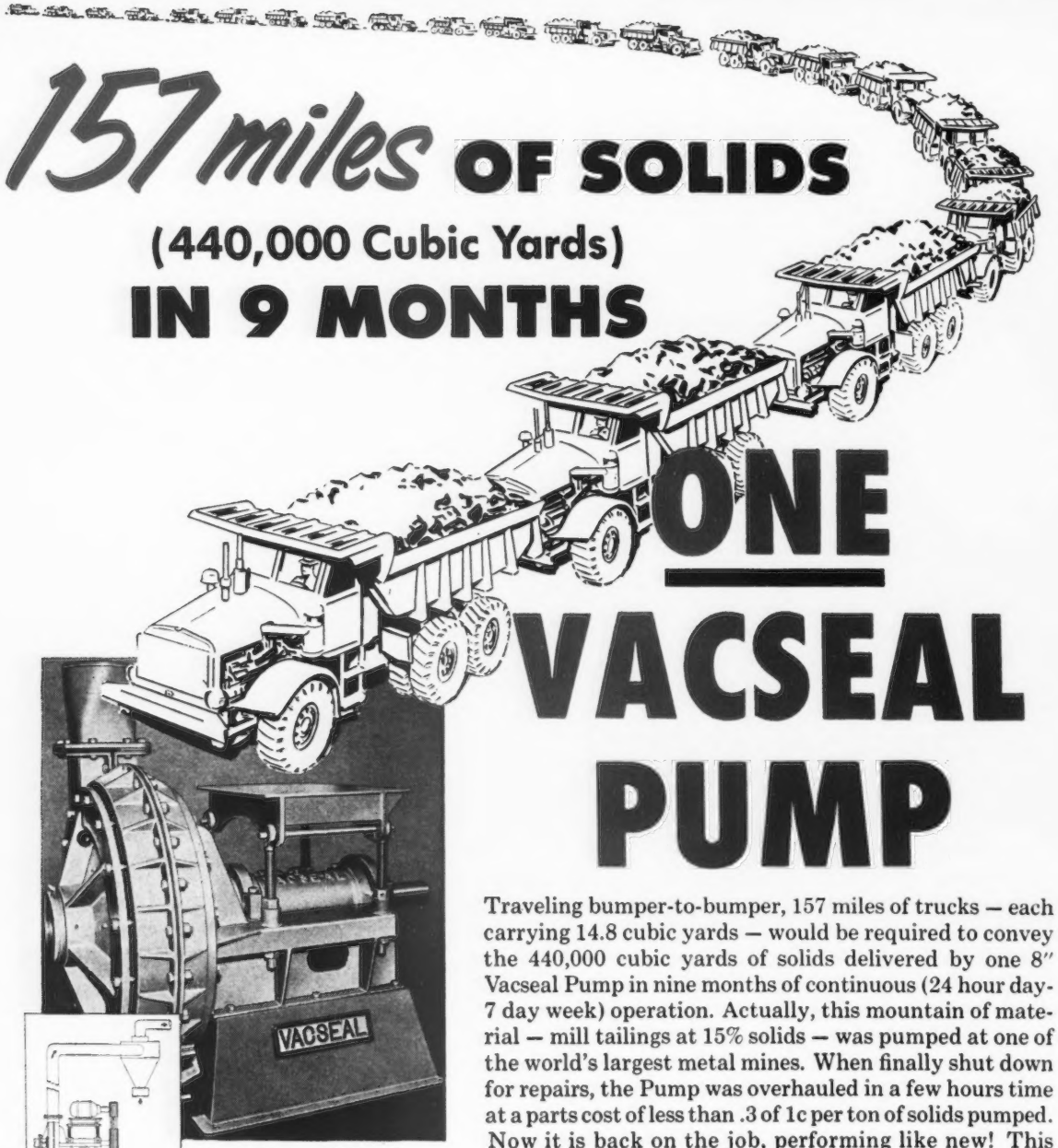


High apron lift prevents any possibility of material's jamming. Even when loaded from overhead, anything that can be put into the bowl can be easily ejected.

WHEN DESIGN MAKES SENSE

157 miles OF SOLIDS

(440,000 Cubic Yards) IN 9 MONTHS



Drawing illustrates this Vacseal application — pumping flotation tailings to a 24" Cyclone.

ONE VACSEAL PUMP

Traveling bumper-to-bumper, 157 miles of trucks — each carrying 14.8 cubic yards — would be required to convey the 440,000 cubic yards of solids delivered by one 8" Vacseal Pump in nine months of continuous (24 hour day-7 day week) operation. Actually, this mountain of material — mill tailings at 15% solids — was pumped at one of the world's largest metal mines. When finally shut down for repairs, the Pump was overhauled in a few hours time at a parts cost of less than .3 of 1c per ton of solids pumped. Now it is back on the job, performing like new! This authenticated Vacseal record from a world-famous mine is in our files. We invite correspondence and suggest that you write today for literature that gives the reasons why Vacseal standard and vertical pumps can deliver such amazing volume at so low a cost.

(Full details on request)

OTHER GALIGHER PRODUCTS

Agitair Flotation Machines . . Commercial and Laboratory Agitair . . Laboratory Ball Mills . . Geary-Jennings Samplers . . Geary Reagent Feeder . . Laboratory Pressure Filters . . Acid-Proof Sump Pumps.

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Salt Lake City, Utah
P. O. Box 209

EASTERN OFFICE
921 Bergen Avenue
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Agents In All Principal Foreign Mining Districts

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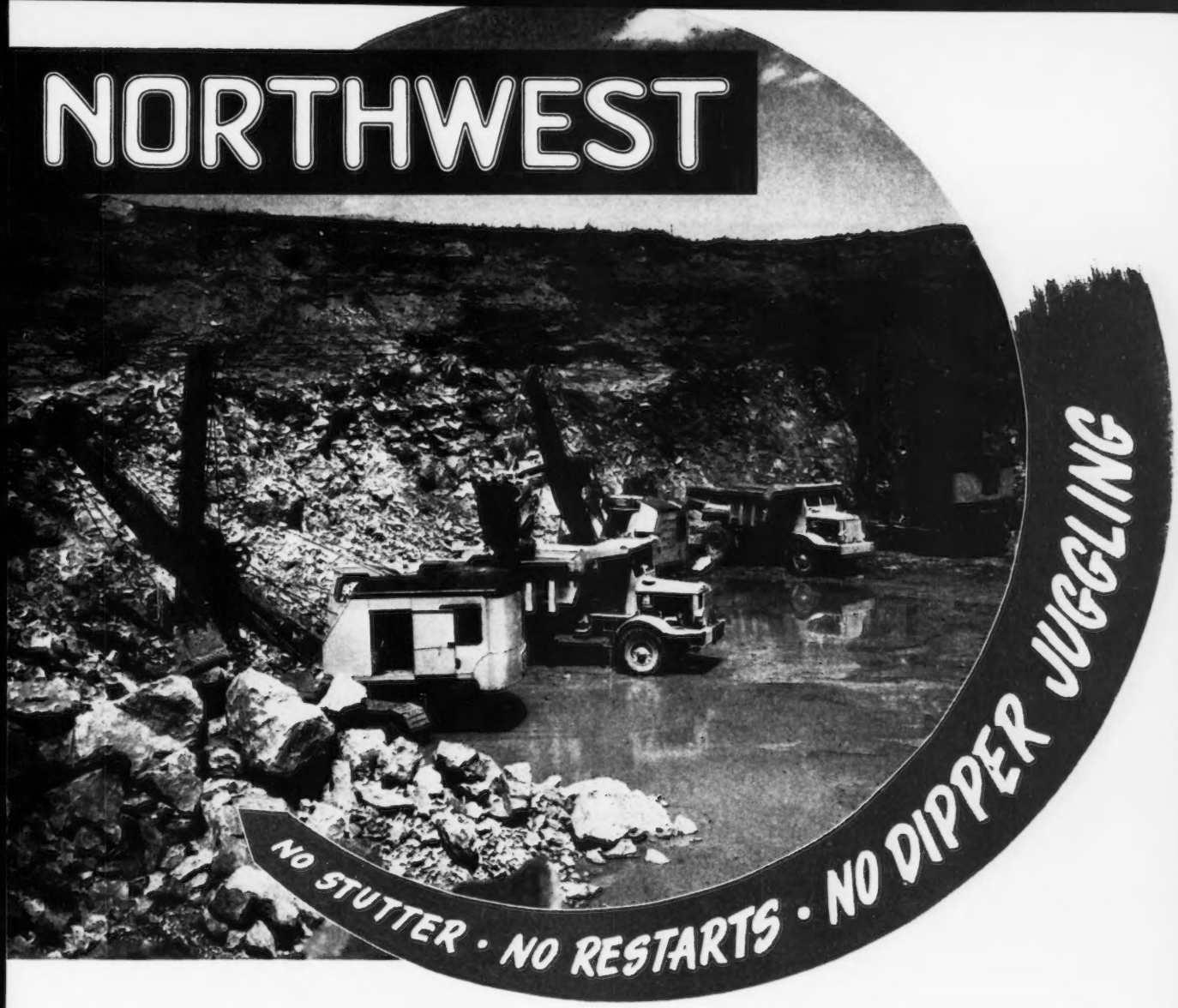
METALLURGICAL DIVISION · THE GALIGHER COMPANY · ENGINEERING SERVICE

CONSULTATION • ORE TESTING
PLANT DESIGN • GEOLOGIC INVESTIGATION

NORTHWEST



Get on a Northwest and feel that Crowd bite into the rock! Count the trucks! A Northwest doesn't waste time! It's a real Rock Shovel — no stutter — no restarts — no dipper juggling either in the bank or in getting the load into the truck. The cycle is smooth. Operation is easy. The Northwest Dual Independent Crowd utilizes force most other independent crowd shovels waste. The swing takes hold smoothly — no jerks, no grabs — the dipper is up and out — over the truck and back — minute by minute, hour after hour! — That's why you see big output figures in connection with Northwests.

Northwest equipment is profitable equipment to own. That is the reason why one out of every three Northwest Shovels sold is a repeat order in the hands of a successful contractor.

There are many other advantages you should ask about.

NORTHWEST ENGINEERING COMPANY

1509 Field Building • 135 South LaSalle Street • Chicago 3, Illinois

NORTHWEST

Convertible for any Mining Material Handling or Excavation Problem

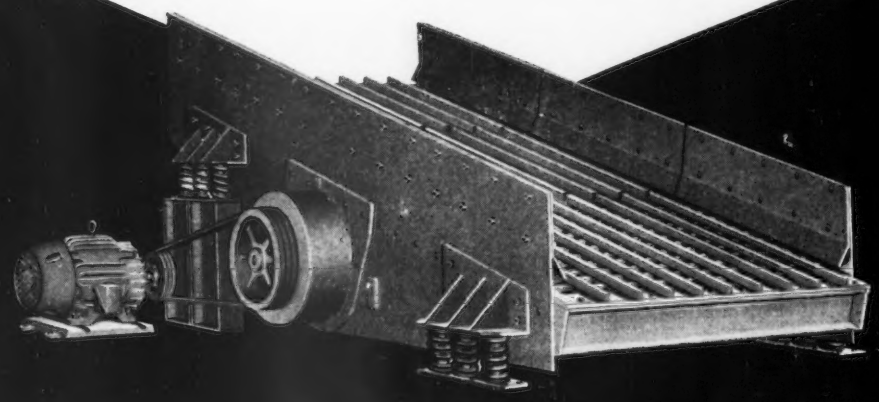
For the best in heavy-duty scalping you need every one of the BIG 4

1 GREAT STRENGTH Massive frame utilizes heavy-section ship channels and H-beam members. Welded deck is securely riveted to thick side plates. Stress-relieved construction easily withstands up to 40-in. boulders dropped from feeder.

2 HIGH CAPACITY Efficient vibrator mechanism permits screening extremely high capacities of sticky ore. Deck can be grizzly or perforated plate, furnished in welded carbon or cast abrasive-resistant steel.

3 EFFECTIVE SEPARATION All vibration is isolated from foundation by large, square-end helical springs and is concentrated in the live deck for thorough action of deepest bed.

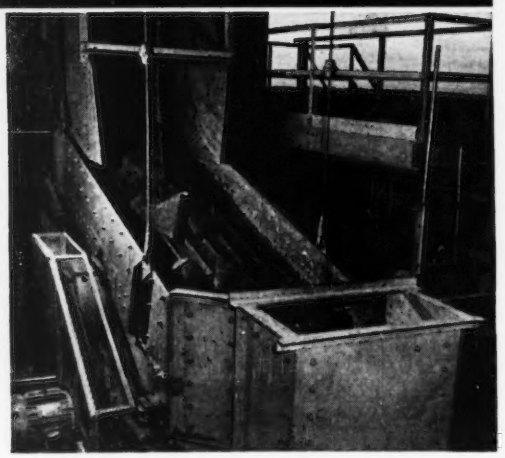
4 TROUBLE-FREE OPERATION Automatic controls limit motion during acceleration and deceleration. Over-size, self-aligning roller bearings and hydraulic bearing removal device.



New LINK-BELT vibrating screen combines all the features essential to low-cost ore handling

LINK-BELT designed and built this heavy-duty scalping screen to the specifications of the men who will use it. Efficient sizing action has been combined with the ruggedness necessary for severe service to produce a screen of the caliber required to do your job.

This new screen can improve your operation by effectively keeping fines out of your primary crushing circuit without being a bottleneck. Ask your Link-Belt representative for all the facts or write for Folder 2461.



Link-Belt heavy-duty scalping screen provides high-capacity sizing at this Minnesota iron ore operation.

LINK-BELT

VIBRATING SCREENS

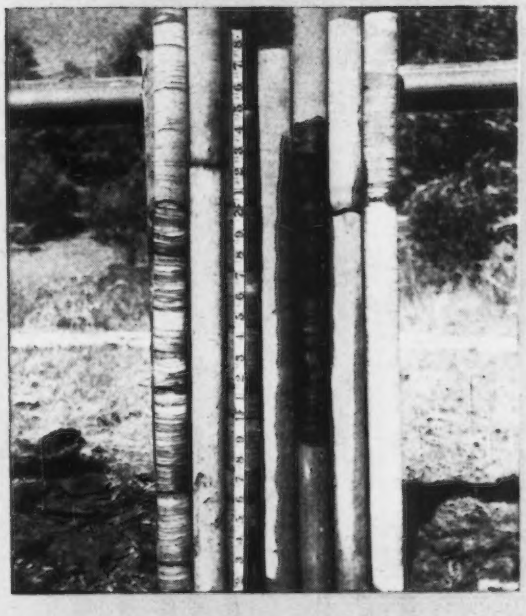
LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, Duluth 2, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices in Principal Cities. 13 323

WANT ACCURATE CORES AT LOW COST?

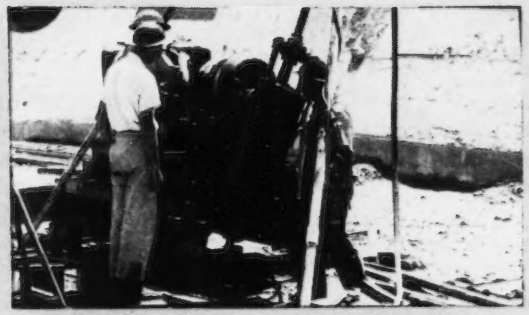
On the strength of the story told by these cores, a new mine was opened and became a big producer. With a Joy Diamond Core Drill, it was a simple matter to analyze and measure these cores and determine, precisely, the mineral content, size and value of the deposit.

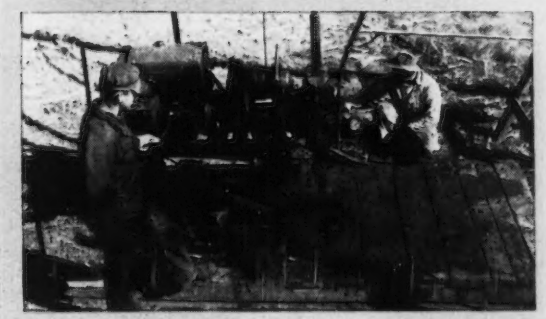
Prospecting can be done at a fraction of the cost and in much less time than any other method. There are many other uses for Joy Diamond Core Drills, too. They're great for blocking out ore bodies, testing sub-surface foundations and completed structures, and drilling holes for pressure grouting, underground drainage, ventilation and gas relief.

For full details on Joy Diamond Core Drills, write for bulletins to **Joy Manufacturing Company, Oliver building, Pittsburgh 22, Pa.** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*



. . . USE JOY DIAMOND CORE DRILLING EQUIPMENT





THE JOY 22-HD is a heavy-duty drill that's rugged, portable and versatile. It's direct-driven with four-speed transmission—either hydraulic or screw-feed swivelhead. An easily-operated, rugged, but sensitive hoist that handles strings of drill pipe up to 2000 feet and operates at hoisting speeds up to 290 feet per minute. Details in Bulletin D-28.

THE JOY 12-B is a highly efficient drill that can be quickly dismantled into four compact units for convenient transportation. With a capacity of 1000 feet, its versatility and portability make it ideal for the other duties required of a sturdy drill. Available on skid or column mounting for surface or underground operation. Skid mounted model uses either hydraulic or screw-feed swivelhead. Details in Bulletin D-21.

CORE DRILLING BY CONTRACT

Complete core drill contracting service by highly skilled crews is available for mineral prospecting, blocking out ore bodies, testing foundations, drilling grout holes, etc. Write for full details.

TRUCO AND JOY-TRUCO DIAMOND BITS AND REAMER SHELLS

Sales and Resetting Service throughout the World by Joy Manufacturing Company

Consult a Joy Engineer

JOY

WAD M522

WORLD'S LARGEST BUILDER OF CORE DRILLS, ROTARY BLAST HOLE DRILLS AND MOTORIZED DRILL RIGS

There's just one reason for building equipment with USS High Strength Steels...

...to cut operating

• 'Dozers, shovels, trucks, and draglines made with USS High Strength Steels have *extra* stamina to keep them working longer and harder. Moving more tonnage. Cutting repair and replacement costs. That's how these strong, tough steels, like USS TRI-TEN, USS COR-TEN, and USS MAN-TEN, help you pack in more profit.

These famous "steels that do more" have a 50% higher yield point than ordinary carbon steel. They provide greater resistance to fatigue, wear, abrasion and impact. As a result, when you replace ordinary steel with USS High Strength Steels of the same thickness, your equipment will have greater strength, longer life, *yet* will weigh no more. On the other hand, by using these steels in appropriate thinner sections you can: (1) reduce equipment weight without reducing its strength; or (2) increase the size and capacity of equipment without increasing its total weight or the power needed to move it.

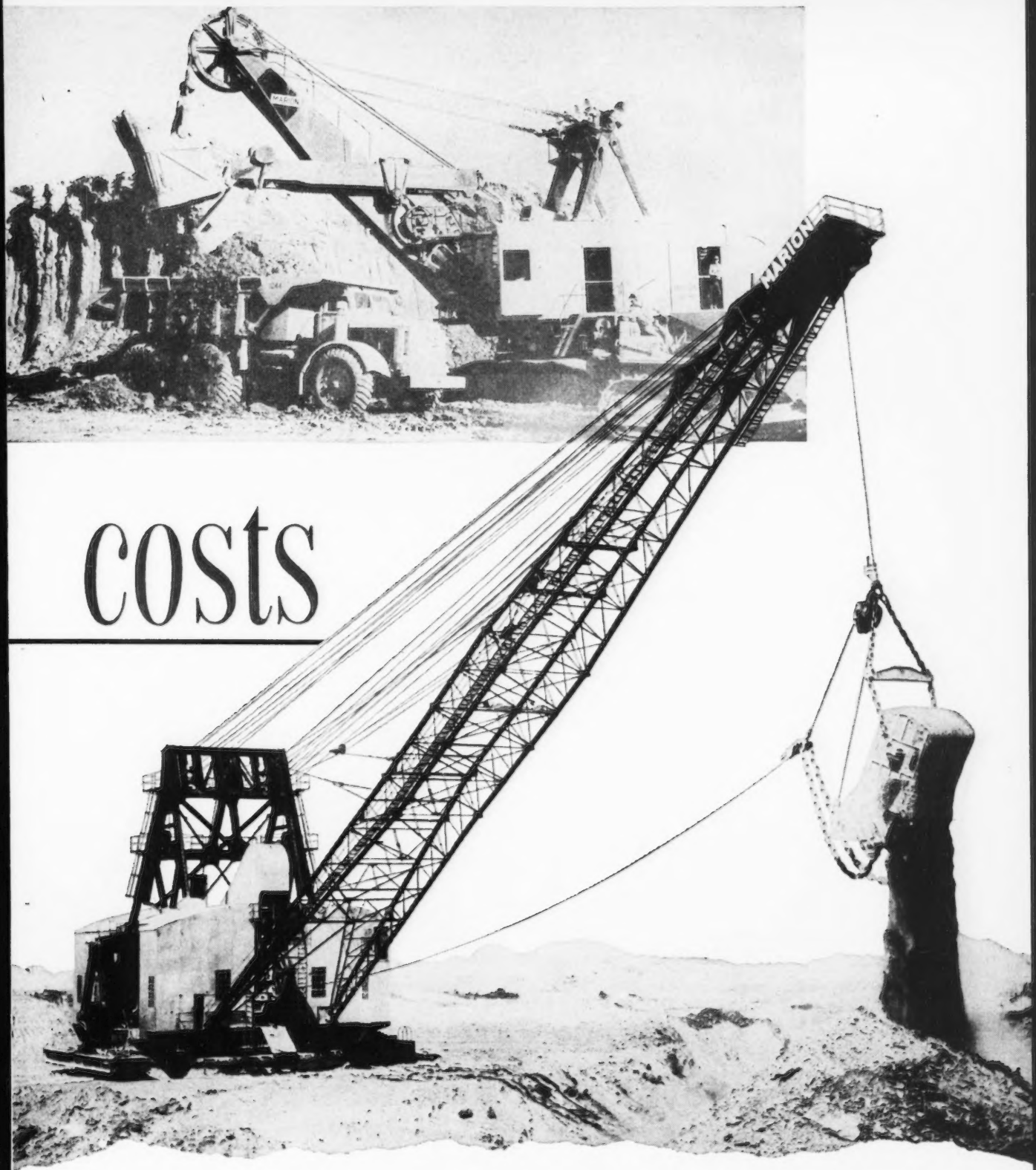
If your equipment must operate at sub-zero temperatures, or in corrosive atmospheres, one or another of the USS High Strength Steels will give it resistance to these destructive forces. Any way you figure it, USS High Strength Steels, used singly or in combination, will make your equipment more productive—keep it *in* service and *out* of the repair shop.

For more information or application data about USS High Strength Steels call or write our nearest office.

New Book gives complete story of

USS COR-TEN steel

Just off the press, this 58-page book is filled with factual data about USS COR-TEN steel. Contains many illustrations of interesting applications as well as physical properties and characteristics, and shows savings that can be affected through its use. Send for your free copy today.



costs

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS High Strength Steels

USS

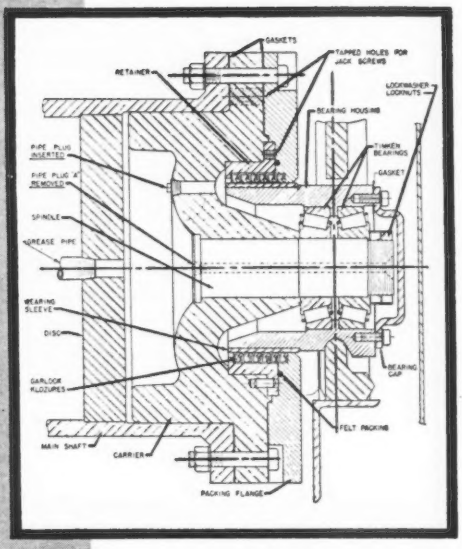
4-1404

UNITED STATES STEEL

how AKINS

leadership in mechanical performance can help you cut costs

Classifiers and heavy media separators are selected on the basis of low-cost-per-ton output resulting from efficient, dependable mechanical and metallurgical performance. That's why so many successful mining companies throughout the world continue to order *and reorder* Akins.



for example...

the patented submerged bearing

- the Akins submerged stub-spindle bearing assembly is designed for equal distribution of radial and thrust loads between two tapered roller bearings. This design provides a sturdy bearing with less wear, lower initial and maintenance costs and dependable, continuous operation . . . one of the many Akins features which result in lower-cost-per-ton production.
- patented Akins method of lubrication through center of mainshaft eliminates grease pipes in pool and provides convenient, centralized lubrication of all grease fittings on main drive.

WRITE FOR CATALOG

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1624 17th Street • Denver 2, Colorado

AKINS CLASSIFIERS • SKINNER ROASTERS • LOWDEN DRYERS

A SUBSIDIARY OF THE MINE & SMELTER SUPPLY CO.

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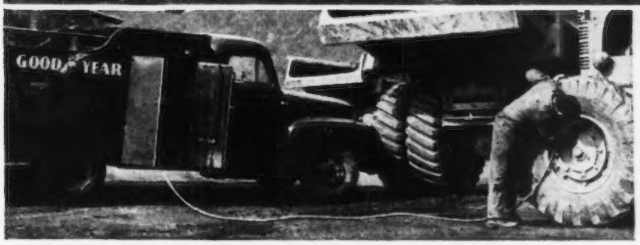
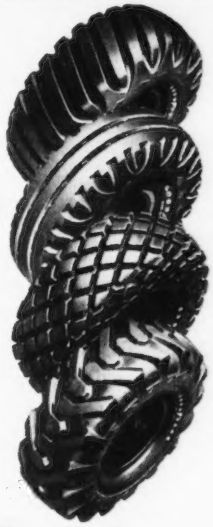


SERVICE TRUCKS, right on the firing line, provide on-spot airing and tire inspection.

Our Nation's Newest Super-Road—the West Virginia Turnpike — cuts, fills, bridges, dams and tunnels its way through worse mountain terrain than most contractors have ever tackled. The 88 miles from Charleston to Princeton are 60% solid sandstone and the rest is "largely landslides!" Even Hercules would doff his helmet to the men and machines that are wrapping this one up in less than 15 months!



And Remember

NOTHING ELSE TAKES IT LIKE

3-T NYLON

No Tougher Test for men or equipment. No surer place to prove the rugged endurance, the superior working qualities of Goodyear off-road and earth-mover tires.

And Today's 3-T Cord Tires are by far the most enduring that Goodyear has ever produced! Goodyear's new and exclusive 3-T process keeps Nylon or Rayon cord at its most bruise-resistant, heat-resistant point, controls tire growth, reduces cracking, tread and body failures to new LOWS. Combined with the toughest tread-stocks yet developed, 3-T Cord is one more big reason why you'll find that Goodyear is there—*all* there—on the toughest jobs you'll ever tackle! Goodyear, Truck Tire Dept., Akron 16, Ohio.

FOR EACH JOB, THERE'S A COST-CUTTING GOODYEAR TIRE!

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

Sure-Grip, All-Weather—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

Photo courtesy American Zinc Co. of Tennessee

This Simplex-TIREX Cable carries 250-volt D.C. power to a 25-horsepower slusher hoist 800 feet from the main power line. The cable runs from pillar to pillar and is supported every fifty feet by a cane-shaped hanger wedged into the pillar.

The scraping of many hundreds of tons of ore per day rests upon the consistently satisfactory performance of this lone cable. Here is an operation where "cost cutting" by buying cheap cable simply cannot result in profit. Dependable day-in, day-out operation are primary requisites. Profits rest on it.

Simplex-TIREX Portable Cables are quality cables. They are engineered and manufactured to meet the toughest, most difficult operations that mining affords. They will withstand the blows of falling ore, spalling rock, etc. TIREX Cables were first made more than 35 years ago to meet and overcome the problems peculiar to mining. That's why you will find TIREX wherever you find mining.

Simplex-TIREX Cords and Cables are cured in lead to give you longer service. They are the only cord or cable that have the famous Selenium Neoprene Armor. When you next need a portable cable for slusher hoists, for loading operations, for electric locomotives, or for any other mining service, be sure that you specify and then insist that you get Simplex-TIREX Portable Cables.

Simplex

TIREX CORDS AND CABLES *are made only by the*

SIMPLEX WIRE & CABLE CO., 79 Sidney St., Cambridge 39, Mass.

1 STEP UP SHOVEL SPEED, YARDAGE. This shovel performs faster, more smoothly, thanks to G-E drive system with amplidyne control. Digging power is increased. The G-E amplidyne system improves response and acceleration. It controls shovel motions precisely, and also prevents excessive current and torque peaks which might damage equipment.

5 ways General Electric can help you mine more tons per man-hour

1. **Step up shovel speed, yardage**
2. **Haul more ore**
3. **Get full voltage at point of use**
4. **Cut relocation time**
5. **Increase drill footage**

SEE NEXT PAGE FOR DETAILS

GENERAL ELECTRIC

2 HAUL MORE ORE. High availability of General Electric locomotives means you can haul greater tonnages. In normal use, G-E locomotives are on the job 24 hours a day, seven days a week, with little time required for maintenance.

G-E ENGINEERED ELECTRICAL SYSTEMS MEAN

Faster open pit mining at less cost

You need speed, flexibility, and safety in your open pit mining operations if you are to meet present demands for higher production per man-hour. General Electric's modern, engineered electrical systems can help you do this in five ways:

1. You can speed up the digging cycle. G-E amplidyne-controlled drives provide faster hoist, swing, and crowd action on power shovels. Shovels work around the clock with minimum time lost for maintenance or repairs.

2. You can haul greater tonnages. G-E locomotives have outstanding records for high availability. They maneuver rapidly, efficiently, and help speed all switching operations. Easily accessible for maintenance.

3. You can increase mining efficiency and safety with G-E unit substations. They improve voltage levels—make full equipment capacity available. Distribution losses are reduced. Grounding systems help protect personnel and equipment.

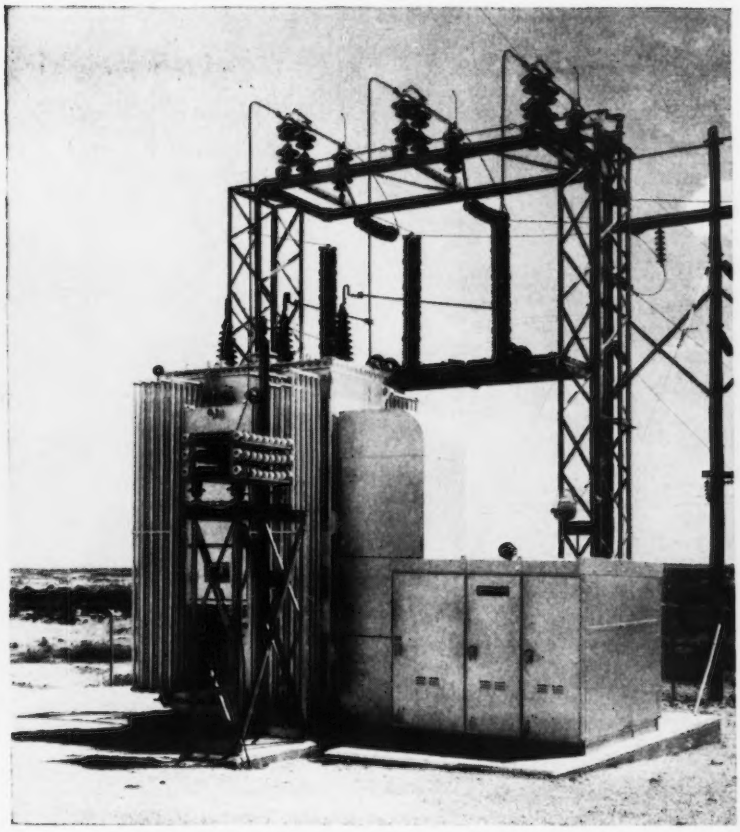
4. G-E cable-skid switch houses give a more flexible power system arrangement. You can cut relocation time of all equipment. Moving is simplified. Cable connecting time is minimized.

5. You can step up drilling speed. Modern rotary and churn drills, powered by General Electric, are self-propelled. Smooth, fast control and rugged motors help them to drill harder rock at higher speeds.

These production-boosting techniques can be applied to your surface mining operation. A G-E mining industry specialist can show you how. Contact him at your nearest G-E Apparatus Sales Office. General Electric Company, Schenectady 5, New York. 660-31

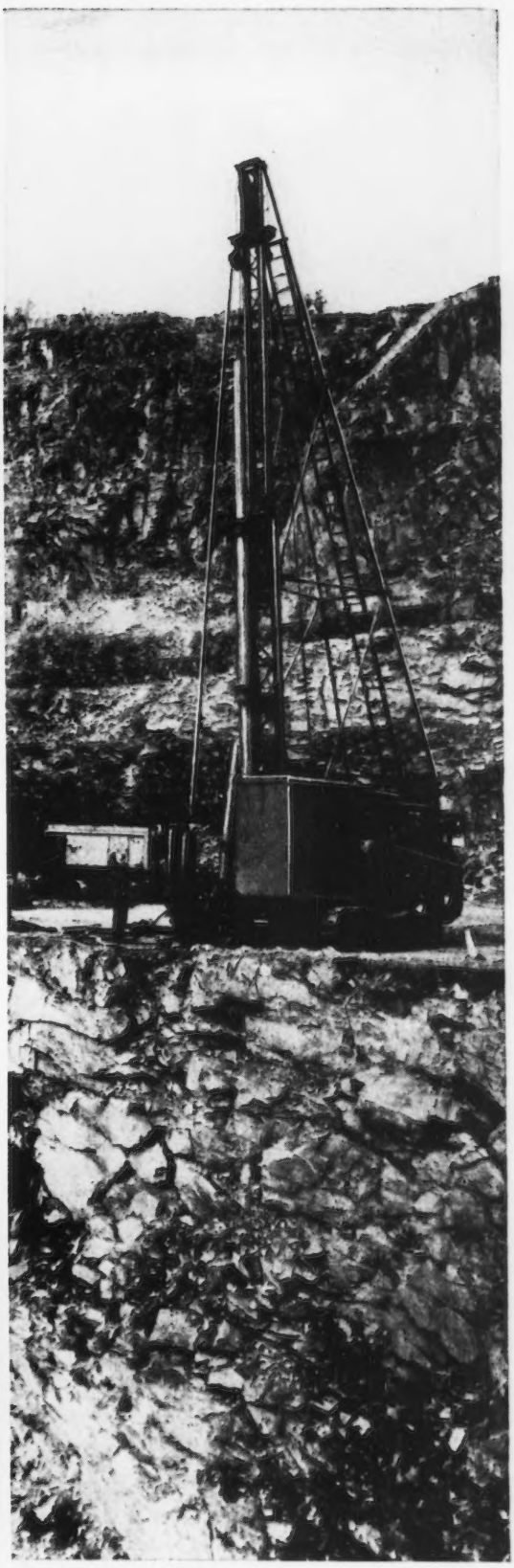
Engineered Electrical Systems for the Mining Industry

GENERAL ELECTRIC



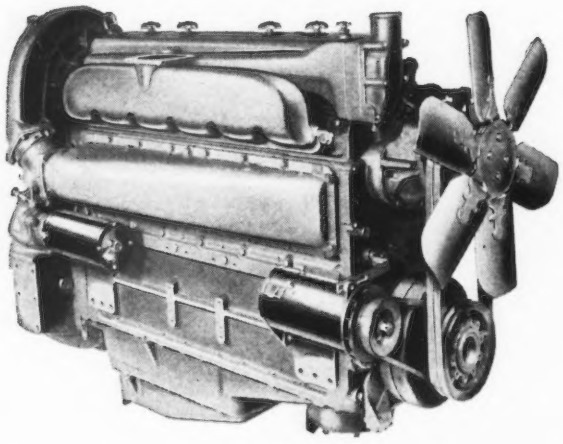
3 GET FULL VOLTAGE AT POINT OF USE by locating G-E factory-assembled unit substations near work area for full equipment capacity. Magne-blast breakers help protect feeders; lightning arresters help prevent outages; grounding resistors increase safety.

4 CUT RELOCATION TIME. Standard G-E cable-skid switch house has polarized couplers to simplify and speed up cable interchanging. Easy-to-move skid house means flexible power system.



5 INCREASE DRILL FOOTAGE. Self-contained churn drill, powered by G.E., provides rapid rock penetration, promotes effective drilling, blasting practices.

NOW 300 HORSEPOWER



in GM "6-110" diesel engine

Improved Design Gives Still More Power Per Pound From Same Size Unit

Want more power—and production—from your heavy-duty equipment?

Stymied because you can't fit a higher-horsepower Diesel into your units?

Now you can get the power you need—and the increased production you want—with a new 300-horsepower General Motors "110" Diesel—the engine that delivers more torque in the working range. And, you can get them with no increase in engine size or weight.

Higher horsepower means faster operating speeds—high torque means more working power—for operators of all kinds of heavy-duty units.

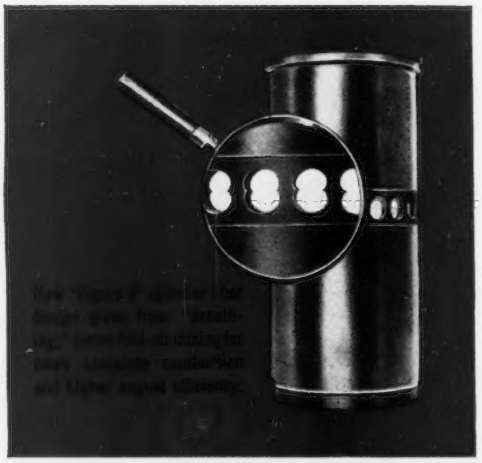
In off-highway trucks this combination means better hill-climbing, more trips per day, bigger pay loads.

In shovels it means faster digging and loading, more yardage, lower maintenance costs.

In drilling rigs it means more hole per day, faster round trips.

In tractors it means more power for pulling, pushing or "dozing."

Get full details on the new, more powerful GM Series 110 Diesels from your GM Diesel distributor. Have him show you that GM Diesels cost less to buy, less to run and less to maintain than any other Diesel.



GM
GENERAL MOTORS
DIESEL POWER

DETROIT DIESEL
ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines . . . 16 to 300 H.P. Multiple Units . . . Up to 864 H.P.

"I was promised delivery today,

but now I'm told you've no stock of one rope and only half enough of another. This delay is costing me money and plenty of it. From now on it's Roebling for me!"

* * *

You can count on prompt and full delivery of Roebling wire rope. Your nearest Roebling office and distributor will help you choose the rope that will perform and stand up best in mining service. And you'll get what you want, when you want it – straight from nearby warehouse stock.

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Subsidiary of The Colorado Fuel and Iron Corporation

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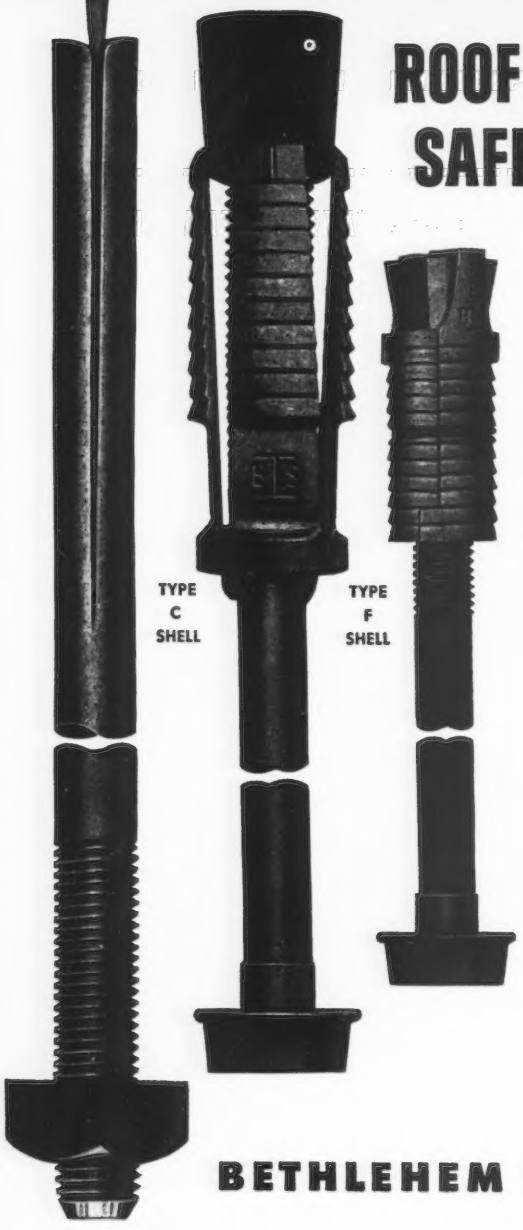


ROOF BOLTS MAKE YOUR MINE SAFER...MORE PRODUCTIVE

YOUR MINE becomes a safer place in which to work when roof bolts are used. Roof bolts promote safety because they consolidate layers of strata into a single, thick beam. This minimizes the possibility of serious roof falls.

Roof bolting also offers these other important advantages: increased production, wider clearances, greater freedom in operating mechanical equipment, and improved ventilation.

All of these desirable operating conditions can be obtained by using any of these four types of Bethlehem Roof Bolts:

SLOTTED BOLT

This 1-in. bolt has a centered, forged slot. No metal is removed in slotting. Opposite end of bolt has 5 in. of rolled threads. Bolt is for use in 1¼-in. hole. When driven against back of hole, wedge is forced deep into slot, expanding the bolt-end. Bolt has truncated-cone point to prevent damage to threads. Usually furnished with American Standard Regular Square Nut.

SQUARE-HEAD BOLTS

Bethlehem manufactures (1) a square-head ¾-in. carbon-type roof bolt having a minimum breaking load of 20,000 lb, (2) a ⅞-in. high-strength roof bolt having the same minimum breaking load, and (3) a ⅞-in. high-strength roof bolt with a minimum breaking load of 40,000 lb.

These bolts can be furnished with or without ears on the shanks, to accommodate either the Bethlehem 4-leaf Type C expansion shell or the matching-halves Type F expansion shell.

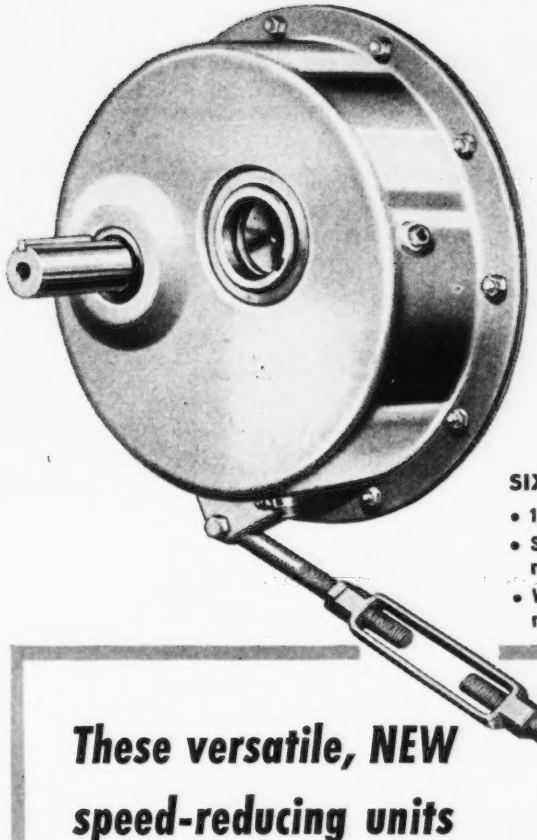
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

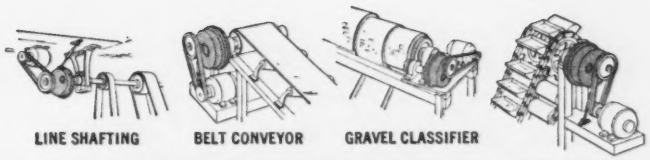
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM MINE ROOF BOLTS

BETHLEHEM STEEL

Falk ALL-STEEL Shaft Mounted Drives



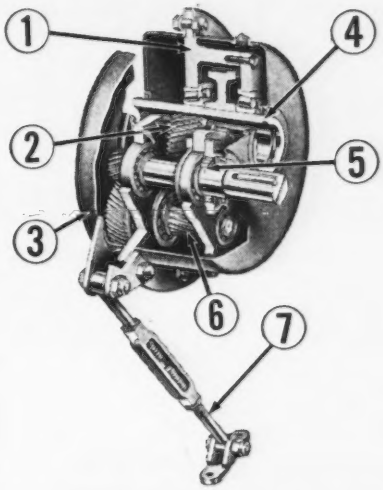


APPLICATIONS UNLIMITED

The range of applications to which the all-steel Falk Shaft Mounted Drive is ideally suited is so wide that complete listing is impracticable. The sketches above are included only to indicate a few typical installations where considerable speed reduction in limited space is an important advantage.

SIX SIZES

- 1/2 to 30 hp
- Single or double reduction
- Wide output speed range—420 to 10 rpm



These versatile, NEW speed-reducing units

save space, power, material and time

Here is the economical solution to the countless application problems requiring efficient speed reduction in limited space! The new Falk all-steel Shaft Mounted Drive—a modification of the universally-accepted Falk Motoreducer design—embodies many exclusive structural and functional features which add up to better service, longer life and substantial savings.

This rugged, compact drive mounts directly on the driven shaft—a distinct saving in floor space. Its precision Falk helical gearing gives highest mechanical efficiency, with a resultant power saving. No adjustable motor bases or slide rails are required. Installation is simple and rapid—output speeds can be quickly changed; thus time is saved...Write to Department 247 for engineering bulletin, including selection and dimension details.

FALK "In-Built" Factors... that give maximum efficiency, convenience and dependability

1 **All-steel Frame,** with more than double the rigidity of iron, supports all rotating elements.

2 **Precision Helical Gears,** designed and machined by Falk, rated to AGMA standards.

3 **Pressed Steel Housings,** whose sole function is to keep oil in, dirt out; easily removed for gear inspection without dismounting unit.

4 **Through Hollow Shaft** with counter bore provides for easiest installation or removal from driven machine shaft extensions.

5 **Backstop** can be furnished with the unit or added later for positive prevention of reverse rotation.

6 **Positive Lubrication,** continuous direct dip of revolving elements at all speeds.

7 **Tie Rod** and turnbuckle serve as anchor and facilitate V-belt or chain adjustment.

THE FALK CORPORATION, Milwaukee 8, Wisconsin

MANUFACTURERS OF

- Motoreducers
- Speed Reducers
- Flexible Couplings
- Shaft Mounted Drives
- High Speed Drives
- Special Gear Drives
- Single Helical Gears
- Herringbone Gears
- Marine Drives
- Steel Castings
- Weldments
- Contract Machining

FALK

...a good name in industry

if you want lower V-Belt costs—

When a V-Belt bends, you can feel its sides change shape.

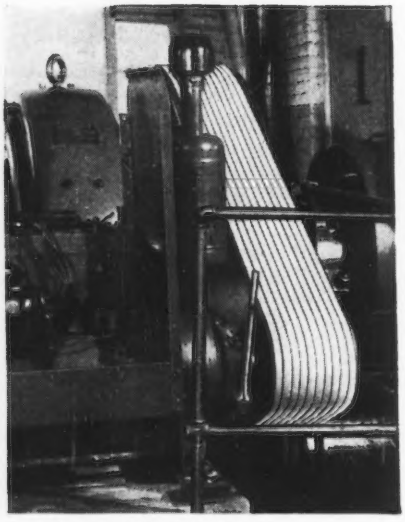
just make this simple test

Take *any* V-belt that has *straight* sides (Fig. 1). Bend that V-belt while you grip its sides with your fingers. You will *feel* the sides *bulge out* (Fig. 1-A). Clearly, that out-bulge forces the belt to press *unevenly* against the V-pulley—and this *concentrates* wear at the points shown by arrows (Fig. 1-A).

Now bend a Gates Vulco Rope with CONCAVE SIDES (Fig. 2)

(U.S. PAT. NO. 1813698)

Instead of *bulging*, the precisely engineered CONCAVE SIDES merely *fill out* and become perfectly straight. This belt, when bent, *precisely fits* its sheave groove (Fig. 2-A). The sides of the Gates Vulco Rope press *evenly* against the V-pulley. Therefore, wear is distributed *uniformly* across the *full face* of this belt —resulting in *longer* belt life and *lower* belt *costs* for you!



Typical Gates Vulco Rope Drive —the Gates V-Belts are built with Concave Sides to insure longer belt wear.

When you buy V-belts, be sure to get the V-belt with the Concave Sides—the Gates Vulco Rope!

Gates VULCO ROPE DRIVES

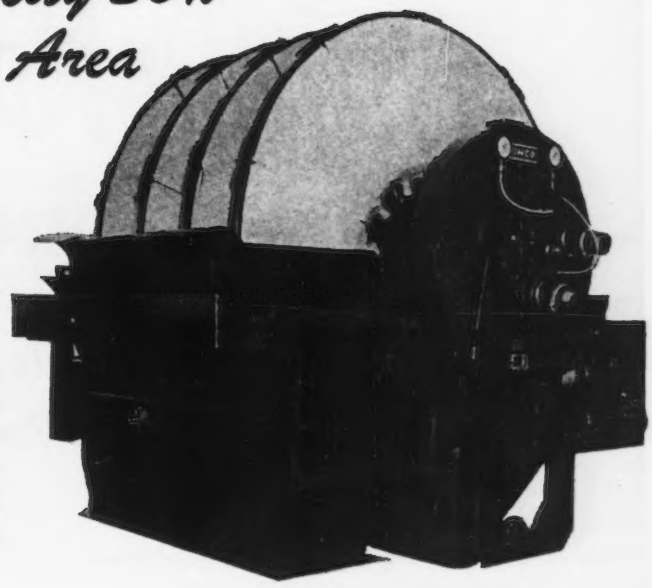
REG. U. S. PAT. OFF.

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

THE GATES RUBBER COMPANY
DENVER, U.S.A.

CS-543

Increase Filter Capacity 20% Per Square Foot Area

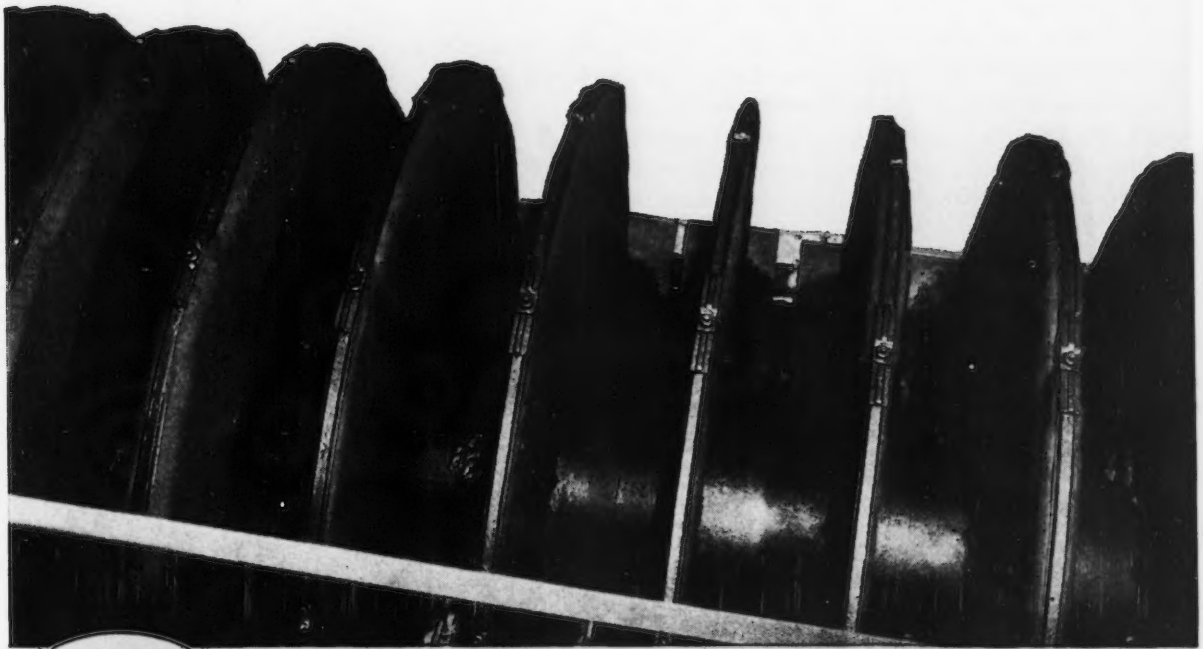


Actual operating data from important mining companies show that Eimco Agidisc filters improve the recovery of concentrates from fast settling slurries.

On a copper concentrate the improvement in tonnage was 20% over the conventional disc on a square foot of filter area per hour basis. The moisture content of the cake was 1½ to 2% less on the Eimco Agidisc and approximately ½ of 1% less than on a drum type filter operating on the same feed.

Write for more information on Eimco Agidisc filters to the Eimco Corporation, P. O. Box 300, Salt Lake City 10, Utah.

Above: An Eimco Agidisc — 8′ diam. x 4 disc. Below: An Eimco 8′ diam. x 10′ Agidisc dewatering a fast settling slurry. Note the smooth, evenly distributed cake.



THE EIMCO CORPORATION

Export Offices: Eimco Bldg., 52 South St., New York City • Salt Lake City, Utah—U.S.A.

Branches • New York, 51-52 South Street • Chicago, 301 So. Hicks Road, Palatine, Ill. • El Paso, Texas • San Francisco, 637 Cedar St., Berkeley, Cal. • Birmingham, Ala., 3140 Fayette Ave. • Duluth, Minn. • Kellogg, Ida.

B-29

You Can't Beat An Eimco

Another J&L First—

SpringKore WIRE ROPE

Combines Flexibility and Crush Resistance

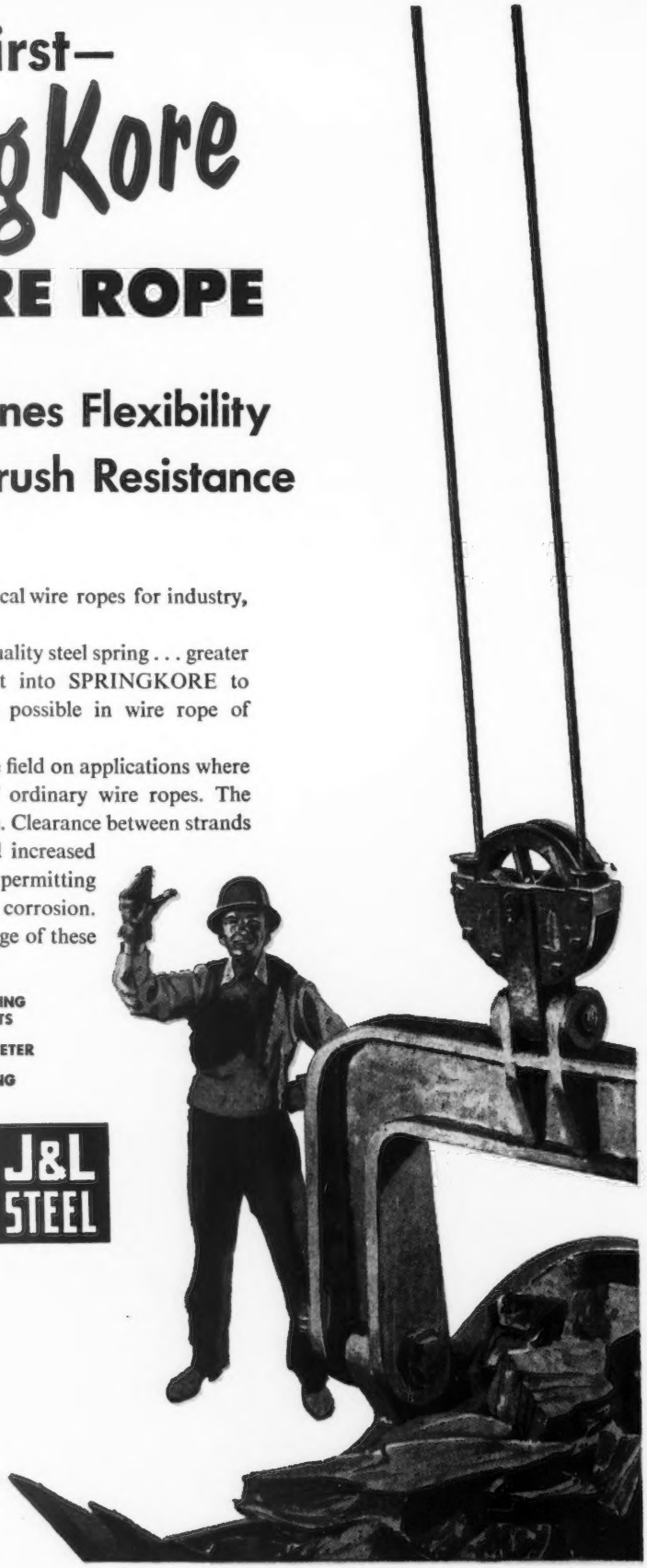
Always working to develop better, more economical wire ropes for industry, J&L has scored another first—SPRINGKORE.

The unique properties of a tightly coiled high quality steel spring . . . greater flexibility and resistance to crushing—are built into SPRINGKORE to provide resiliency and toughness never before possible in wire rope of equivalent strength and cost.

SPRINGKORE has *already* proved itself in the field on applications where heavy crushing action limits the service life of ordinary wire ropes. The diameter stays uniform for a longer period of time. Clearance between strands is maintained resulting in greater flexibility and increased fatigue life. The coiled spring forms a reservoir permitting excellent lubrication to reduce internal wear and corrosion.

Specify new SPRINGKORE and take advantage of these dollar-saving features:

- LONG TERM FLEXIBILITY
- RESISTANCE TO CRUSHING ACTION
- COMPLETE LUBRICATION
- MORE SUPPORTING CONTACT POINTS
- UNIFORM DIAMETER
- BETTER SPOOLING
- LESS INSIDE STRAND WEAR



Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*

J&L STEEL

For further information, write for J&L's new booklet, "New Wire Rope for Industrial Uses."

Jones & Laughlin Steel Corporation
3 Gateway Center, Dept. 412, Pittsburgh 30, Pa.

Please send me a copy of your booklet, "New Wire Rope for Industrial Uses."

Name_____

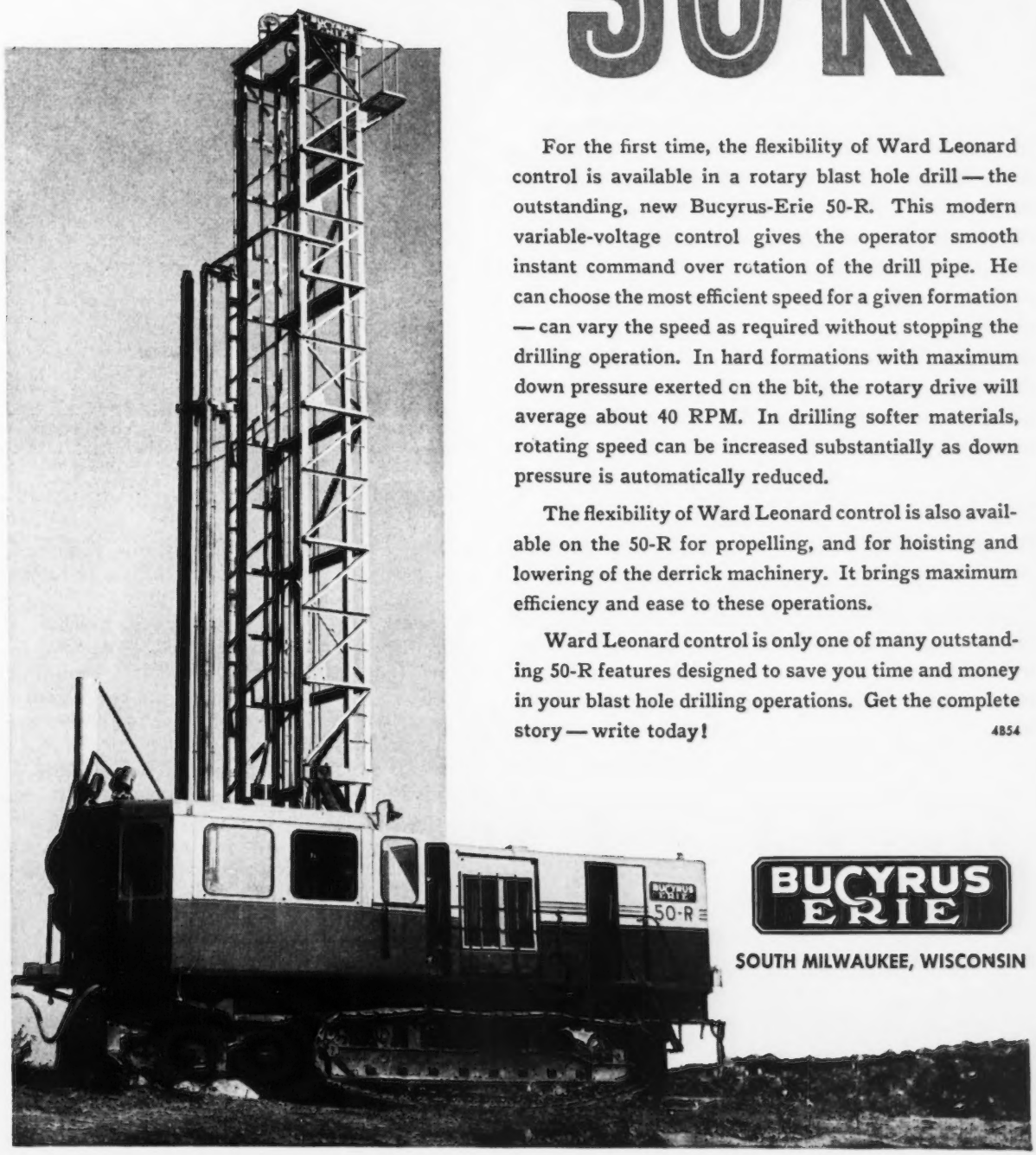
Company_____

Address_____

_____

Your Choice of Drilling Speeds for Maximum Footage

BUCYRUS-ERIE 50-R



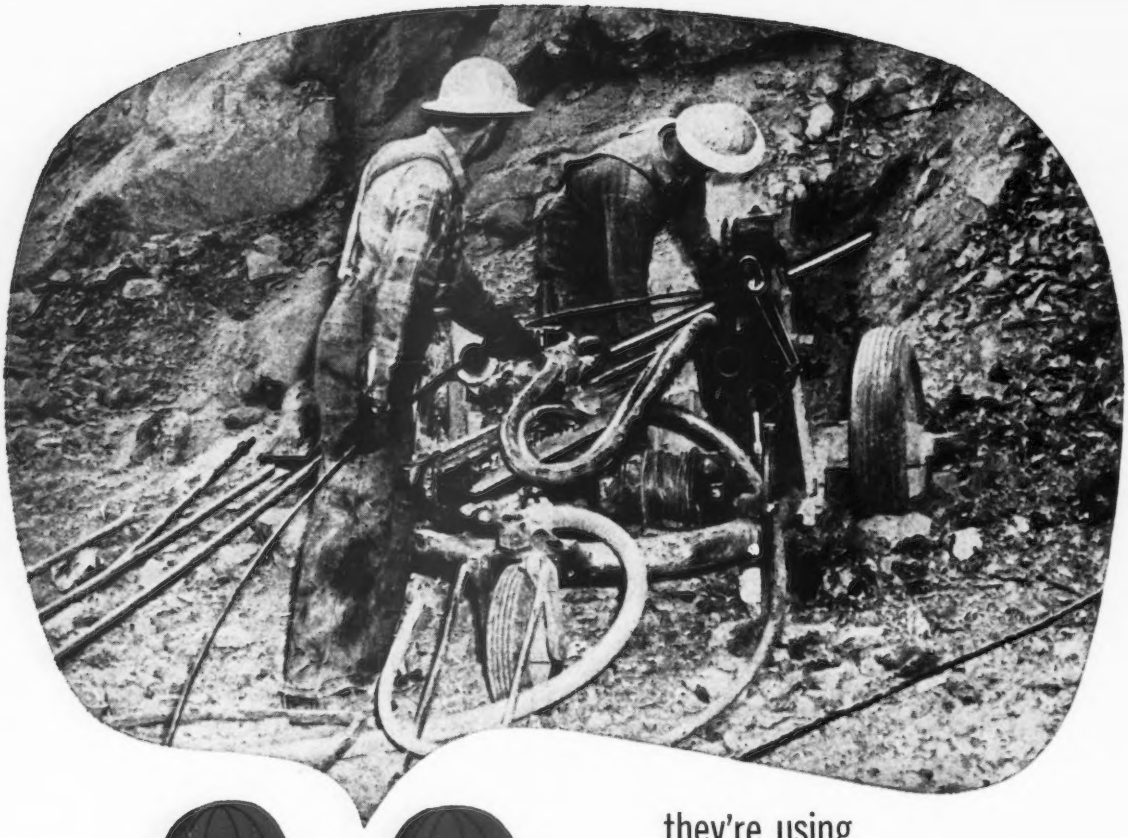
For the first time, the flexibility of Ward Leonard control is available in a rotary blast hole drill — the outstanding, new Bucyrus-Erie 50-R. This modern variable-voltage control gives the operator smooth instant command over rotation of the drill pipe. He can choose the most efficient speed for a given formation — can vary the speed as required without stopping the drilling operation. In hard formations with maximum down pressure exerted on the bit, the rotary drive will average about 40 RPM. In drilling softer materials, rotating speed can be increased substantially as down pressure is automatically reduced.

The flexibility of Ward Leonard control is also available on the 50-R for propelling, and for hoisting and lowering of the derrick machinery. It brings maximum efficiency and ease to these operations.

Ward Leonard control is only one of many outstanding 50-R features designed to save you time and money in your blast hole drilling operations. Get the complete story — write today! 4854

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN



they're using CRUCIBLE HOLLOW DRILL RODS on the New York State Throughway

This new high-speed superhighway will, when completed, speed streams of traffic across New York State from New York City to Buffalo.

It's a big, difficult construction job on which thousands of tons of rock must be moved. That's why you will find Crucible Hollow Drill Rods in use all along the route. Experienced construction men know they can rely upon the performance of these rods under the toughest field conditions.

There is a good reason for the dependability of Crucible Hollow Drill Rods . . . they are made to *tool steel* standards, by the leading producer of tool and special purpose steels. And this *extra* quality means fewer broken rods and lost bits. *For lowest cost per foot of hole drilled* — specify Crucible Hollow Drill Rods.

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking

HOLLOW DRILL ROD

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • MAX-EL • ALLOY • SPECIAL PURPOSE STEELS

New Magnetometer Utilizes Nuclear Wobble

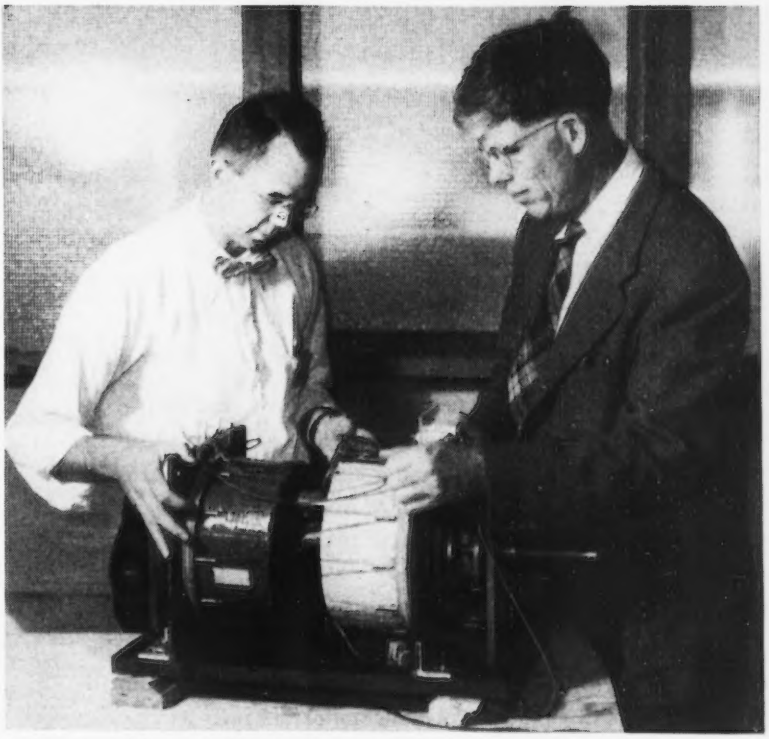
PREVIEW

A NEW TYPE MAGNETOMETER that can be used for geophysical exploration has been developed by Varian Associates, Palo Alto, Calif., under the sponsorship of Byron Jackson Co., Los Angeles, Calif.

The new device weighs only 25 lb, makes precise measurements of the earth's total magnetic field and has no appreciable temperature coefficient. It can record successfully over the same range as other magnetometers used in geophysical exploration.

The instrument contains batteries which create a magnetic field around a container of water. The magnetic field aligns the axis of spin of the hydrogen nuclei in the water to a position that is approximately at right angles to the direction of the earth's field. When the power is shut off the axes of the nuclei tend to recover from the biased position and in so doing develop a wobble (precess). The rate of wobble or frequency of the precess is a function of the earth's (ambient) magnetic field. Through proper electronic equipment this can be translated into a detectable alternating field in the audio-frequency range which in turn becomes an accurate measure of the magnetic field.

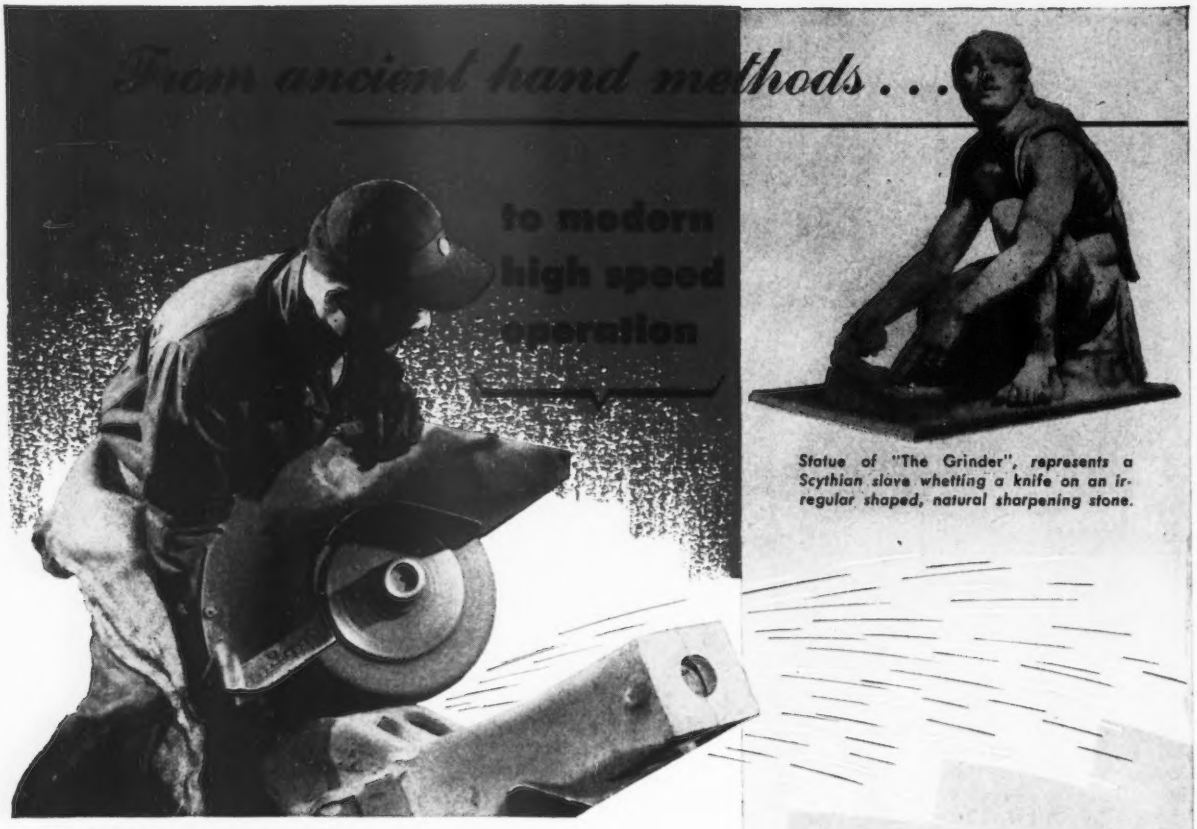
Byron Jackson announced that the instrument will be manufactured in a size, price and technical simplicity which will allow broad application. It will require only one operator. As a prospecting aid, it will be useful to search for magnetic minerals and help determine structure in petroleum-bearing formation.



Spinning nuclei are studied to measure earth's magnetic field in new magnetometer designed by Dr. R. H. Varian (right) and Dr. Martin Packard of Varian Associates.

Varian Associates, a Palo Alto, Calif., firm specializing in research, development and production of microwave equipment, is the exclusive licensee for basic patents involved in the device. Dr. Martin Packard, director of Varian's radio frequency spectroscopy research, and Dr. Russell Varian, president of the firm, developed the magnetometer.

Byron Jackson has participated in the development of several other devices, including a jet shaped charge for oil well perforating and electronic gages for remote measurement of guided missiles.



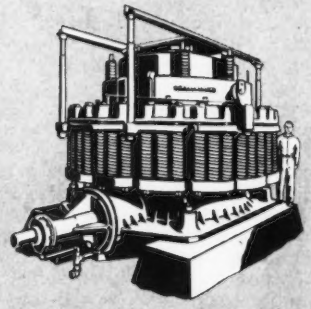
Statue of "The Grinder", represents a Scythian slave whetting a knife on an irregular shaped, natural sharpening stone.

ABRASIVES *have been the* "Silent Partners" *of World Progress*

Since ancient man's first need for tools and weapons, abrasives have been a decisive factor in shaping the progress of civilization. As man's manufacturing abilities increased, natural abrasives were no longer sufficient . . . which led to the use of the first manufactured grinding wheel. Today, practically every man-made product depends upon abrasives.

Of utmost importance in processing, prior to the manufacture of the finished abrasive product, is the method of reducing the hard component materials into workable sizes as quickly and efficiently as possible. *Here, as in all other fields where fast, low cost reduction is paramount for profitable production, SYMONS* Cone Crushers are widely used by the leading producers of abrasive products . . . to produce a constant, uniform size of material.*

NORDBERG MFG. CO., Milwaukee, Wisconsin C-253



SYMONS* Cone Crushers . . . the machines that revolutionized crushing practice . . . are built in Standard, Short Head, and Intermediate types, with crushing heads from 22 inches to 7 feet in diameter — in capacities from 6 to 900 tons per hour.

***SYMONS... A REGISTERED NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD.**

SYMONS PRIMARY CRUSHERS

GRINDING MILLS

MINE HOISTS

SYMONS VIBRATING GRIZZLIES and SCREENS

DIESEL ENGINES

NORDBERG MACHINERY

NORDBERG

SYMONS SCREENS NORDBERG

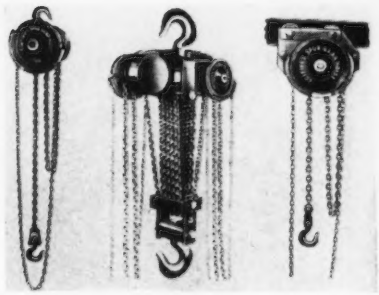
MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

NEW YORK • SAN FRANCISCO • DULUTH • WASHINGTON • TORONTO

MEXICO, D.F. • LONDON • PARIS • JOHANNESBURG

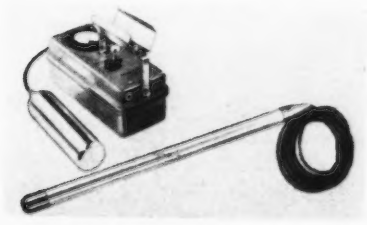
UNDERGROUND SCOOT-CRETE

The 3000-lb capacity "Scoot-Crete" Model N-52 is designed for underground haulage. Features are diesel power and low construction that puts operator's head about 68 in. above floor level. Equipped with flat rack or 14, 16 and 20-cu ft dumpbox bodies, it can turn within its own length (90 in.). Getman Brothers, South Haven, Mich. **(2)**



SPUR GEAR HOISTS

Coffing Hoist Co., Danville, Ill., has added 55 different models and sizes to its line of spur gear hoists. Included are 8 single-chain models in ¼- to 2-ton capacities (left); 14 multiple chain models in 3- to 35-ton capacities (center); and 11 army type trolley hoists in ¼- to 10-ton capacities (right). **(3)**

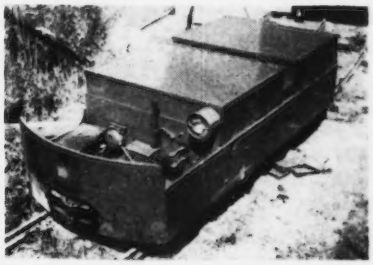


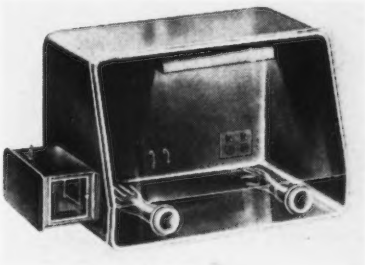
FISSION TACKLE

Scintillation survey meter above is called the "Fission Finder" by Radiac Co., Inc., New York, N. Y., the drill hole probe type radioactivity detector is known as the "Fission Tackle". These instruments are gamma sensitive and claimed to be about 100 times more sensitive than the average Geiger counter. **(4)**

MINE LOCOMOTIVE

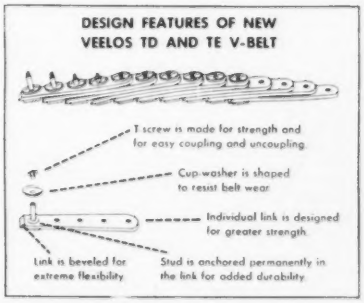
Modern 3½-ton locomotive in a small compact package, weighs 4400 lb with batteries. Width is 45½ in., height, 28 in. Can be designed for any gage track. Features 3-phase fully automatic operation and is equipped with hydraulic disc brakes. Kersey Mfg. Co., Bluefield, Va. **(5)**





CONTROLLED ATMOSPHERE HOOD

Low cost, lightweight, portable controlled atmosphere hood is available from P. M. Lennard Co., Inc., Brooklyn, N. Y. Constructed of chemically inert fiberglass plastic material, it is 36 in. long, 20 in. deep, and 24 in. high. **(6)**

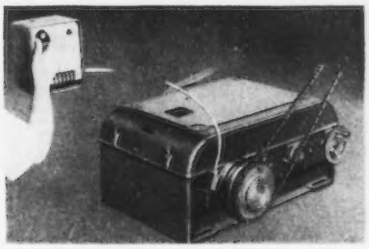

DESIGN FEATURES OF NEW VEELOS TD AND TE V-BELT
T screw is made for strength and for easy coupling and uncoupling.
Cup-washer is shaped to resist belt wear.
Individual link is designed for greater strength.
Link is beveled for extreme flexibility.
Stud is anchored permanently in the link for added durability.

ADJUSTABLE V-BELTS

Adjustable Veelos V-belt for D and E drives is now under production by Manheim Mfg. & Belting Co., Manheim, Pa. Plys of especially treated, high-tensile strength canvas duck, joined by riveted studs with removable cup washers and T screws, are extremely easy to couple and uncouple. **(7)**

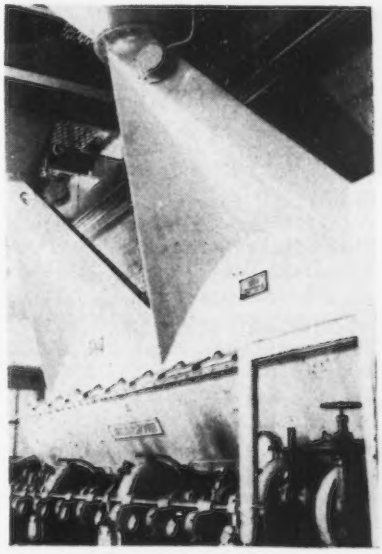
SCINTILLOMETER

Scintillometer, claimed to be 290 times more sensitive than Geiger-type counters, weighs 7 lb. with batteries. Housed in an all metal case with waterproof liner, Model 963 is contour-shaped to sling comfortably against the body in transit. Design is sturdy for rugged field use. Radiac Co., New York, N. Y. **(8)**



SPEED TRANSMISSION

No sudden starts or stops, controlled acceleration from zero to running speed, ease of handling fragile material and smooth processing of other materials are the result of combining an electro-magnetic clutch with Reeves variable speed transmission. For complete details, circle No. 25 on the postage-free reply card opposite p 42. Reeves Pulley Co., Columbus, Ind. **(9)**



BIN LEVEL CONTROL

What looks like a hat box on the side

Standard Engineer's Report

CASE HISTORY

PRODUCT *Calol Vistac Oil*

FIRM *Victorville Lime Rock Co., Victorville, Calif.*

One grade of oil ends desert heat-range problems!

CALOL VISTAC OIL 14X is the only lubricant tried that stays on pistons and other air-tool parts in spite of extreme temperature changes at the Victorville Lime Rock Co.'s quarry at Victorville, Calif. Temperatures range from 0°F. to 120°F. in this desert area, often change as much as 75° from early morning to afternoon. Oils previously used failed to stay in place except in a narrow range of temperature. Calol Vistac Oil 14X prevents excessive wear, sticks on bearing surfaces and helps keep them clean although tools constantly work in heavy abrasive dust around drills above.

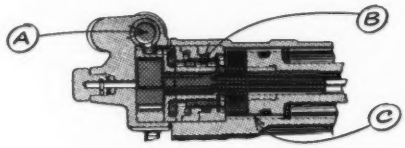
REMARKS: Quarry is in natural deposit of exceptionally pure calcitic limestone. Rock is ground to fine calcium carbonate, used for paint fillers and extenders, and for many other applications.

FREE CATALOG: "How to Save Money on Equipment Operation" will be sent on request to Standard Oil Company of California, 225 Bush Street, San Francisco.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your distributor, write or call any of the companies listed below.

CALOL

How CALOL Vistac Oil cuts cost in air-tool equipment



A. Atomizes quickly and completely—carries evenly over all parts. Does not fog excessively and has no unpleasant odor.

B. Additives help form tenacious oily, pressure-resistant film in wet or dry conditions—cuts wear and power loss. Small quantity lubricates efficiently.

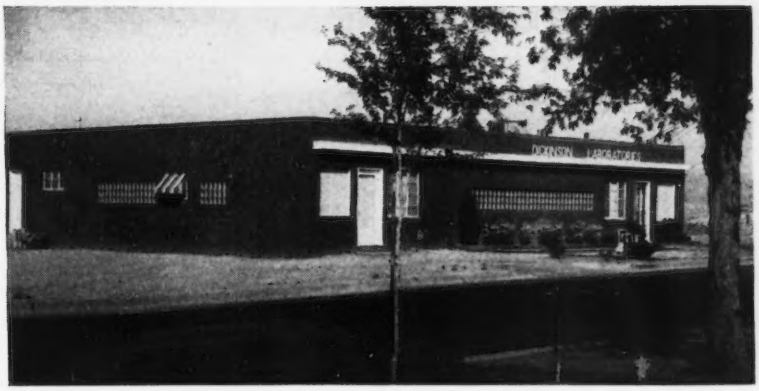
C. Resists high temperatures and oxidation. Stays fluid at low temperatures.

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

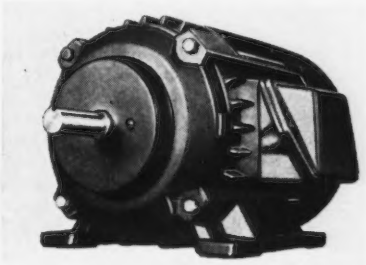
THE CALIFORNIA COMPANY
P. O. Box 780 • Denver 1, Colorado

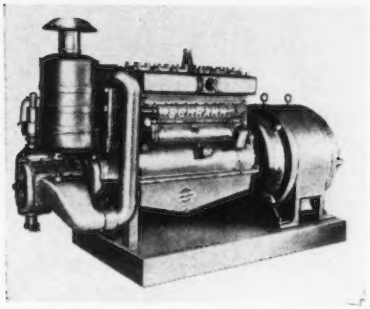
STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas



Attractive new addition just completed represents two years of progress for Dickinson Laboratories, founded in 1952 at El Paso, Texas. Assayers, chemists and metallurgists, everyone in the organization speaks Spanish as well as English. The firm also acts as representative for ore shippers at Mexican border points.

of the chute on p 37 is the control mechanism that acts to shut off flow of dry material to a bin that has been filled to a desired level. Actuating this mechanism is a rod (sensing probe) that extends outward and downward into the bin through a rubber sphere located between housing and chute. Operating details are available from Scrayco, Bound Brook, N. J. **(10)**



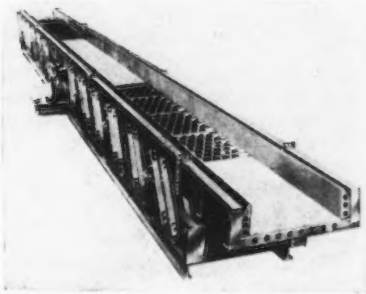


ELECTRIC MOTORS

A new line of well protected, versatile squirrel-cage induction motors has been announced by Reliance Electric and Engineering Co., Cleveland, Ohio. First of the new motors, built to recently adopted standards of NEMA, will be built for 1, 1½, and 2 hp applications. The rest of the line, up to and including 30-hp will be introduced at regular intervals in 1954 and early 1955. **(13)**

COMPRESSOR

Model 600 Super Unistage compressor is designed to provide 600 cfm of air at 100 psi. Powered by a 150-hp induction motor (synchronous motors available) the unit is vibrationless and can be installed without an expensive foundation. Can be moved from one location to another on a fork truck. Schramm, Inc., West Chester, Pa. **(11)**



VOICE-POWERED TELEPHONE

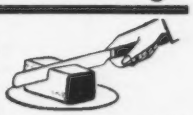
Your voice makes the electricity that carries the sounds. And because it doesn't depend on outside power sources, batteries or bulky generating equipment, in time of emergency, the sound-powered telephone is ready for use. It works up to 20 mi.

A diaphragm inside the mouthpiece actuates a vibrating reed which generates the electricity required for the telephone. It's made by Wheeler Insulated Wire Co., Waterbury, Conn. **(12)**

VIBRATING CONVEYORS AND SCREENS

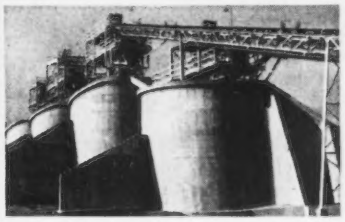
Syntron Co., Homer City, Pa., announces a complete line of balanced, dual-trough vibrating conveyors and screens for conveying or screening, or conveying, screening and distributing bulk materials, hot or cold, dry or damp, from fine powder to big chunks. Units come in various sizes with up to 280 tons per hour maximum capacity. **(14)**

what's NEW in Engineering



A new free-hand electric bandsaw is said to cut through metals "like a knife through butter". It is light enough (16 pounds) to be used free-hand in any position, and the power driven unit is claimed to be the first completely portable unit of its kind. Slightly larger than a hand hacksaw, it is about 15 times faster.

On Puget Sound at Steilacoom, Kaiser Engineers designed and recently completed one of the nation's most modern aggregates plants to supply the growing demand for sand and gravel in the Pacific Northwest. A unique feature of the plant's



construction was the erection of serpentine walls in the sand and gravel storage areas to eliminate dead space. The new plant's flexibility of operation is such that it not only can handle most common sizes of gravel, but also any other specific sizes ordered by customers. Its crushing and screening capacity is 375-500 tons per hour.

Conditioning of Water for Industrial Use is the title of a new book, written by Sheppard T. Powell being published by McGraw-Hill this month. This modern guide to water conditioning describes the various types of apparatus in detail, including design features, control required for efficient performance, cost of installation and operation and other pertinent information.

Whether it's designing an oil refinery, building a manufacturing plant or laying out a plant site, Kaiser Engineers undertakes the job with assurance because of the variety of talent within the organization. Successful experience in a wide field of design, engineering and construction tells the story. Call or write: Kaiser Engineers, Division of Henry J. Kaiser Company, Kaiser Building, Oakland 12, California.

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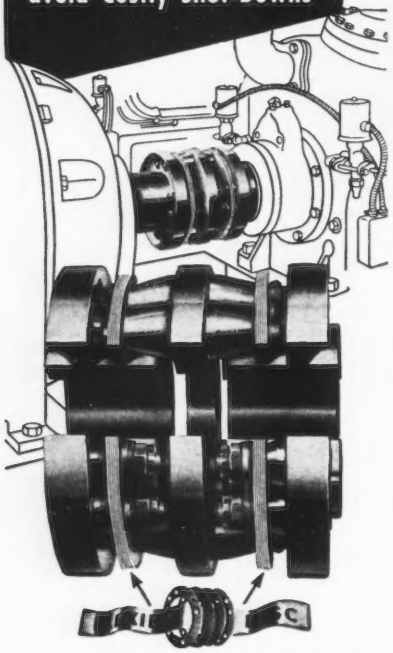
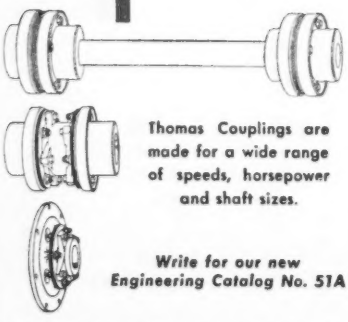
FLEXIBLE COUPLINGS
for Power Transmission to avoid Costly Shut-Downs



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

DISTINCTIVE ADVANTAGES

FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.

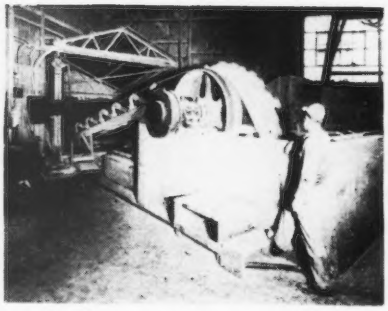


Thomas Couplings are made for a wide range of speeds, horsepower and shaft sizes.

Write for our new Engineering Catalog No. 51A

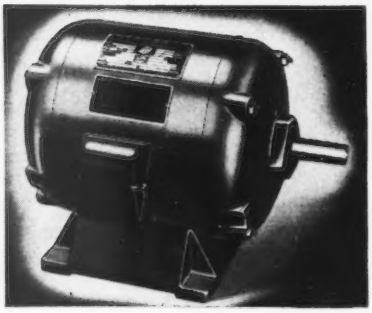
THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

E&MJ NEW PRODUCTS DIGEST



CONVEYOR HOLD-BACK

Enclosed roller type hold-back is designed to prevent reversal of bucket elevators and inclined conveyors due to power failure under load. It consists of an inner member with wedge pockets for 6 hardened rollers, which rotates with the shaft. When shaft attempts to reverse, rollers wedge against outer cylinder. Pressure springs and plungers insure instant engagement. Hold-back releases instantly when forward motion of shaft is resumed. Bulletin 444X from Stephens-Adamson Mfg. Co., Aurora, Ill., has all details. **(15)**

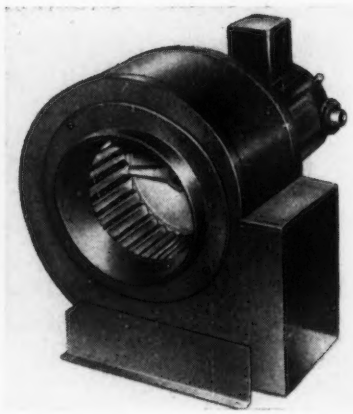


ELECTRIC MOTORS

Electric Motor Division, A. O. Smith Corp., Milwaukee, Wis., is producing their line of motors, from ½ to 150 hp, to conform with the new NEMA standards, but will offer users the new motors in either the present or the new mountings to make changeovers easier. **(16)**

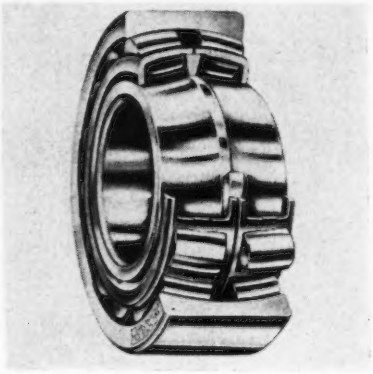
MOISTURE METER

Less than 2 minutes to determine the percentage of surface moisture in powdered, granulated or fibrous materials, is the claim of Heyl & Patterson, Inc., Pittsburgh, Pa., for the Olivo moisture meter which they are currently marketing. Accurate readings can be obtained for the range from 0 to 60% moisture. A vial of calcium carbide is placed with sample in small pressure vessel. Fragile vial is broken by shaking and escaping carbide combines with surface moisture to form acetylene. Pressure of gas generated is measured to reflect moisture content. **(17)**



BLOWER

This 600-cfm blower for quick removal of fumes, smoke, or for cooling and ventilating, is available from Standard Electric Mfg. Co., Inc., West Berlin, N. J. It features an automatic cutout which stops the completely enclosed 110-v, 60 cycle motor before it can overheat. **(18)**



ROLLER BEARINGS

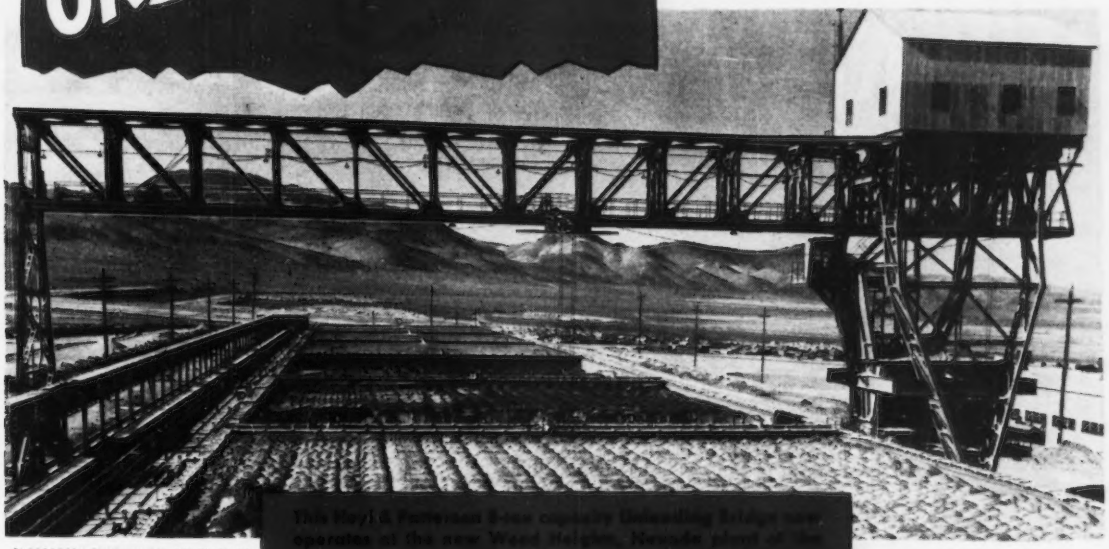
Increased anti-friction bearing capacity of from 25% to 50%, and service life 2 to 3½ times longer than formerly possible, is claimed for SKF's improved design of spherical roller bearings. There is no increase in size or weight. Specific sizes, capacities and other information is available in a 12-page booklet offered by SKF Industries, Inc., Philadelphia, Pa. **(19)**

TRUCK TIRE

Extra tread truck tire called the U.S. Royal Super Fleetway, is said to be the first commercial tire made with supertenacity rayon cord that is stronger than rayon. With this carcass, it is claimed, the new tire has up to 79% more flex fatigue resistance and 20% more resistance to ruptures, assuring more recappings. United States Rubber Co., New York, N. Y. **(20)**

For further information, use card opp. p 42.

ONE OF A KIND... *For a Reason!*



PHOTOGRAPH THROUGH THE COURTESY OF ANACONDA COPPER MINING COMPANY

This Heyl & Patterson 8-ton capacity Unloading Bridge now operates at the new Weed Heights, Nevada plant of the Anaconda Copper Mining Company. A Heyl & Patterson Loading Bridge and a Heyl & Patterson Rotary Grate also function at this new plant.

This Unloading Bridge was specifically designed and built by Heyl & Patterson to perform one definite function for Anaconda Copper Mining Company . . . to dig tailings from the leaching vats at Anaconda's new Weed Heights, Nevada plant and load these tailings, by way of a hopper, into trucks for disposal.

This bridge operates smoothly and efficiently without wasting time, motion or power because it was designed particularly for this one job.

When *your* problem centers around the handling and transportation of ore, coal or other heavy bulk materials . . . the wisest move you can make is to consult Heyl & Patterson, specialists in this field for over 60 years.

Heyl & Patterson has the complete facilities necessary to answer your Heavy Bulk Materials Handling problem. We have our own engineering department . . . our own machine shop . . . our own research department . . . and our own service department.

Call on Heyl & Patterson to help you. An experienced Heyl & Patterson engineer will gladly talk over your problem with you at no obligation.

Ore Bridges
Railroad Car Dumpers
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Coal Preparation Plants
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Boat Loaders and Unloaders
Rotary Mine Car Dumpers
Coal Crushers
Coal Storage Bridges
Car Hauls and Boat Movers
Bradford Breakers
Refuse Disposal Cars
Thorsten Coal Sampling Systems
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Reineveld Centrifugal Dryer

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THE NEW

150-HP CAT* DW15 TRACTOR

the answer to important earthmoving needs!

Do you need a fast, four-wheel tractor that can work effectively in narrow, confined areas, yet keep pace with larger units?

The DW15 is your answer! It has ten forward speeds up to 24 m.p.h. . . . up to 31.3 m.p.h. with optional gears. With matching scraper, it carries up to 15 cu. yds. per load at these speeds. It can maneuver in tight cut, fill or haul road situations.

Do you need a wheeled tractor with power and exceptional lugging ability?

The DW15 is your answer! Its new 150-HP diesel engine is matched to its weight and capacity. Its heavy-duty clutch and transmission match the engine. Engine, clutch and transmission are designed and built by one manufacturer.

Do you need a unit that will produce all day without exhausting operators?

The DW15 is your answer! The hydraulic booster makes steering easy . . . only eight pounds of steering effort are needed. Air-boosted flywheel clutch, constant-mesh transmission, large-capacity air brakes, anti-jackknife protection and a comfortable bucket-type seat with hydraulic snubber provide the operator with safe, easy operation.

Do you need a tractor that will give you a profitable day's production, day in and day out?

The DW15 is your answer! Designed and built by Caterpillar, it is available with a complete line of matched units . . . scrapers, bottom dump and side dump wagons.

Call your Caterpillar Dealer today. He'll give you complete details on this new high-production, high-speed earthmoving machine. He'll show you the DW15 in action.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

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NAME THE DATE... YOUR DEALER WILL DEMONSTRATE

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

POWER TRANSMISSION. A 24-page catalog filled with drawings, tables, ratings and dimensions of variable speed pulleys, wide V-belts, sheaves, motor bases, counter shafts and "Select-O-Speed" transmission is available from Lovejoy Flexible Coupling Co., Chicago, Ill. **(51)**

MOTOR SELECTOR. This useful 12-page bulletin (B-2102) lists performance characteristics, construction features, dimensions, price and other information needed for ordering a Reliance squirrel cage induction motor of from 1 to 200 hp. Reliance Electric and Engineering Co., Cleveland, Ohio. **(52)**

TRACTOR ATTACHMENTS. Booklet 31016 tells how comfort, utility and safety can be added to wheel and track-type tractors and motor graders through the use of attachments available at your Caterpillar dealer. Caterpillar Tractor Co., Peoria, Ill. **(53)**

DENSITY INDICATOR. Here's a nuclear-electronic method of indicating density of slurries without having to take samples. The unit is bolted into the production line and measures any density range. It is said to be a rugged instrument and automatically compensates for temperature. Full details are in a circular from Sierra Industrial Instrument Co., San Francisco, Calif. **(54)**

ELECTRICAL METERS AND CONTROLS. Here's a buyer's guide electrical and maintenance men will want; 187 pages of description, photographs and model numbers and sizes, of electrical and electronic instruments including laboratory and portable test units, bridges, switchboard instruments, pyrometers, thermometers, transformers, rectifiers, photoelectric controls, timers, counters, heaters, furnaces, solenoids and what-have-you. Circle No. 55 on the postage-free reply-card below, to get your copy of Catalog No. 54 from Electro-Tech Equipment Co., New York, N.Y. **(55)**

STEEL BARGES. If you are handy to water transportation you'll be interested in this 28-page booklet illustrating and describing welded steel barges, hopper and tank types, published by Dravo Corp., Pittsburgh, Pa. **(56)**

MOTORPUMP SELECTION. Interesting and informative booklet (Form 7123) tells how the centrifugal pump works and what factors are most important in selecting a pump for a specific installation. Booklet winds up with actual installation views. Ingersoll-Rand, New York, N.Y. **(57)**

RAILROAD CARS. "The manufacture of railroad cars for service in foreign countries has been our specialty since 1898" says the forward of this 55-page bulletin on railroad cars from Gregg Co., Ltd., New York, N.Y. A goodly portion of the cars illustrated and described will be of interest to mining men. **(58)**

UBRICATION. "Proper Lubrication . . . The Life Blood of All Machinery" is the title of a booklet loaded with recommendations for the uses of different grades of "lubriplate" made by Lubriplate Division, Fiske Brothers Refining Co., Newark, N. J. **(59)**

KILNS, COOLERS, DRIERS. Descriptions in this well illustrated booklet, while fairly general, will give the reader a good idea of the construction features of the kilns, coolers and driers manufactured by Traylor Engineering Co., Allentown, Pa. **(60)**

TUNGSTEN ORE BENEFICIATION. Brochure announced by American Cyanamid Co., New York, N.Y., describes various methods of processing tungsten ores, particularly the froth flotation processes used on western U.S. ores. **(61)**

SHOVEL-CRANE. Link-Belt Speeder Corp., Cedar Rapids, Ia., are touting their new 98 series as "today's most advanced one-yard shovel-crane." They tell you why in Book 2530, showing the unit in action, highlighting construction details and featuring its "Speed-O-Matic" full power hydraulic control which is said to be unique on a 1-yd shovel-crane. **(62)**

BLAST HOLE DRILL. Here's your chance to get all the details on the new "Quarrymaster" for rotary and percussion drilling, recently developed by Ingersoll-Rand, New York, N.Y. Drawings, photographs and tables supplement description in this 16-page piece. **(63)**

VIBRATING CONVEYOR. Bulletin offered by the Gifford-Wood Co., Hudson, N.Y. illustrates and describes the company's "Oscilveyor" vibrating conveyor. Explains how the "Oscilveyor" operates and gives features which make it particularly desirable for handling fine granular materials. Included are dimensioned engineering drawings and tabular information correlating pan size with the speed at which the material travels. **(64)**

VOLUME PUMP. A 24-page two-color bulletin describes Lapp Insulator Company's line of Pulsafeeder diaphragm-type controlled volume pumps. The maintenance free feature of no stuffing box is stressed throughout the bulletin, and it is also pointed out that Pulsafeeder, although basically a pump, also functions as a chemical feeder, a meter, an instrument, a filling machine, a proportioner and a sampler. **(65)**

ALLIS-CHALMERS LINE. The complete line of Allis-Chalmers Manufacturing Co. industrial equipment is pictorially described in the catalog "Presenting the Allis-Chalmers Line." Expanded to 36 pages to include illustrated information and data. A 10-page section is devoted to data on the selection of allied equipment and field-proved attachments engineered for use with A-C equipment. **(66)**

VALVE. Pennsylvania Pump & Com-

USE THIS CONVENIENT CARD

to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, tear out and mail.

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JULY, 1954

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Please send me the catalogs or further information about the items from New Products Digest whose numbers are circled.

1	8	15	22	29	36	43	50	57	64	71	78	85	92
2	9	16	23	30	37	44	51	58	65	72	79	86	93
3	10	17	24	31	38	45	52	59	66	73	80	87	94
4	11	18	25	32	39	46	53	60	67	74	81	88	95
5	12	19	26	33	40	47	54	61	68	75	82	89	96
6	13	20	27	34	41	48	55	62	69	76	83	90	97
7	14	21	28	35	42	49	56	63	70	77	84	91	98

My Name ..... Position .....

Company .....

Address .....

pressor Co., Easton, Pa. Bulletin No. 509-D describes the Pennsylvania Air-chek valve which the company claims benefits users of compressed air and gases because it is easily installed and provides certain advantages not obtainable elsewhere. **(67)**

RHINO BLADE. Shunk Manufacturing Co., Bucyrus, Ohio, offers a new special alloy steel cutting edge, the Rhino Blade, so called because of its rugged construction. Will greatly reduce downtime caused by the need for blade replacement. **(68)**

INDICATING TEMPERATURE TRANSMITTER. Catalog 1022 tells about indicating temperature transmitter which features dial type thermometer and pneumatic transmitter in combined unit. List of standard dials, helpful hints when ordering, photographic illustrations and line drawings. Penn Industrial Instrument Corp., Philadelphia, Pa. **(69)**

PROTECTIVE COATINGS. Atlas Mineral Products Co., Mertztown, Pa. announces availability of a booklet containing some 50 pages of information on protective coatings described on a generic basis. **(70)**

BUSINESS TELEPHONE. A 6-page, illustrated brochure called "The P-A-X Code Call Service" describes how executives and key employes can be quickly reached anywhere in the plant or office by means of a special signaling device that is part of an internal business telephone system. Automatic Electric Co., Chicago, Ill. **(71)**

JAW CRUSHER. Twenty-four page booklet, #1124, gives full information on the Traylor "M" crusher, built in 8 sizes with capacities up to 300 tons per hour. Bulletin shows outstanding construction features by the use of cutaway illustrations and exploded drawings; gives complete capacities and power requirements. Traylor Engineering and Manufacturing Co., Allentown, Pa. **(72)**

DIESELS. A series of 2-color bulletins covering the full line of P&H Diesel Engines is announced by Harnischfeger Corp. Diesel Division, Crystal Lake, Ill. Printed on two sides of an 8½ x 11-in. sheet handy for filing and reference, there is a separate bulletin for each diesel with pictures of all models, from 20 to 138 hp, 2, 3, 4 and 6 cylinders. **(73)**

STEEL REINFORCED FLOORING. Claimed to outlive the plant itself, this steel-reinforced flooring is especially designed for trucking aisles, loading docks and other similar areas subjected to materials handling equipment and severe abuse. The product may be used on interior or exterior surfaces of concrete or wood. United Laboratories, Inc., Cleveland, Ohio **(74)**

ENGINEERING SERVICES. A new brochure offered by Barnes & Reinecke, Inc., Chicago, Ill., outlines the scope of services offered by this engineering organization from design of a refrigerator, lighting fixtures, and other household appliances, to engineering and testing of diesel engines, and design and construction of special machines, aircraft maintenance docks, and a supersonic wind tunnel. **(75)**

BATTERY MAINTENANCE. An 8-page pocket-sized booklet (Form 5063) on storage battery maintenance has been announced by Exide Industrial Division of The Electric Storage Battery Co., Philadelphia, Pa. The booklet breaks down battery care to seven basic rules, each emphasized with a catchy cartoon treatment and a minimum of explanatory text. **(76)**

V-BELTS. A detailed brochure containing engineering and design data on multiple V-belts has just been issued by the Goodyear Tire & Rubber Co., Akron, Ohio. Including the recently approved horsepower ratings by the Rubber Manufacturers Association and the Multiple V-Belt Drive & Mechanical Power Transmission Association, the handbook contains a comprehensive explanation of the fundamentals of V-belt design. **(77)**

TEMPERATURE CONTROL. Burling Instrument Co., South Orange, N.J., has issued Bulletin 102, the second of a new series describing their line of temperature controls. It covers the Models V-IC and V-IX which are primarily used for high temperature safety alarms and cut-outs up to 1800 deg F. **(78)**

VIBRATING CONVEYOR. Booklet describing the Hewitt-Robins line of vibrating conveyors is amply illustrated with pictures of typical installations handling such material as red hot steel castings, scrap metal, sand, shredded wood bark and crushed limestone. Covers technical details of both the Rockermount and Springmount type conveyors. A copy of the booklet, No. 135-A, may be obtained from Hewitt-Robins, Inc., Stamford, Conn., by using card below. **(79)**

ROOFING. Corrugated aluminum roofing and siding for shops and buildings is described in a new booklet published by Aluminum Co. of America, Pittsburgh, Pa. A feature of the booklet is the story about the maintenance-free characteristics of aluminum as a building material. **(80)**

SHEAVES. We are told by the Browning Mfg. Co., Maysville, Ky., that the handy, 24-page pocket size booklet they sent us is designed to "better acquaint customers with some of the outstanding features and advantages of Browning Gripbelt sheaves with malleable split taper compression bushings." **(81)**

INSTRUMENTS. A 64-page reference book titled "Research and Control Instruments—X-ray and Analytical Equipment" is available from the Research & Control Instruments Division, North American Philips Co., Inc., 750 South Fulton Ave., Mount Vernon, N. Y. **(82)**

FLUIDIZED FEEDER. The new Sawyer Bailey Fluidized Feeder for handling dense phase solids in the same manner as liquids, can be applied to either processes or material handling and is fully described in a brochure offered by the Sawyer Bailey Corp., Buffalo, N. Y. **(83)**

LIGHTWEIGHT PIPE. As a practical help to pipe users, Naylor Pipe Co., Chicago, Ill., has just issued bulletin No. 507 showing typical applications of its lightweight lockseam-spiralweld pipe and fittings. Included are standard specifications on pipe from 4 to 30 in. in diameter, with data on fabricated fittings. **(84)**

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MORE LOADING AND LESS WAITING

Continuous production is dependent on many uncontrollable factors underground; but in loading the ore in the car there are factors we can help you eliminate — WAITING — LOST TIME.

Old chute and grizzly systems are always a source of trouble. "Hang-ups" persist no matter how carefully the grizzly level is attended. Going up the chute is dangerous, shooting out the hang-ups almost invariably break out some timbering that must be replaced.

New methods are being adopted in many mines. Drawpoint loading under stopes is proving to be the cheapest, fastest and safest system, eliminating the old hazards and in addition — saving on powder both in shooting in the stope and in secondary blasting because Eimcos can load blocky chunks of ore into the car.

Write The Eimco Corporation, P. O. Box 300, Salt Lake City 10, Utah, for more information on drawhole mining with Eimcos.

THE EIMCO CORPORATION

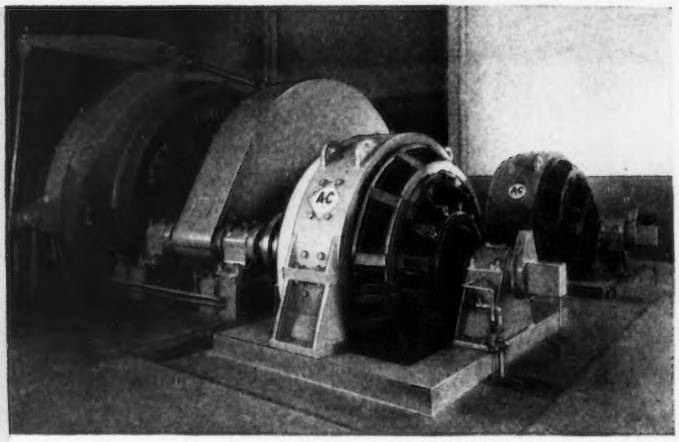
Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Texas Birmingham, Ala. Duluth, Minn. Kellogg, Ida. London, Eng. Paris, France Milan, Italy

P 38

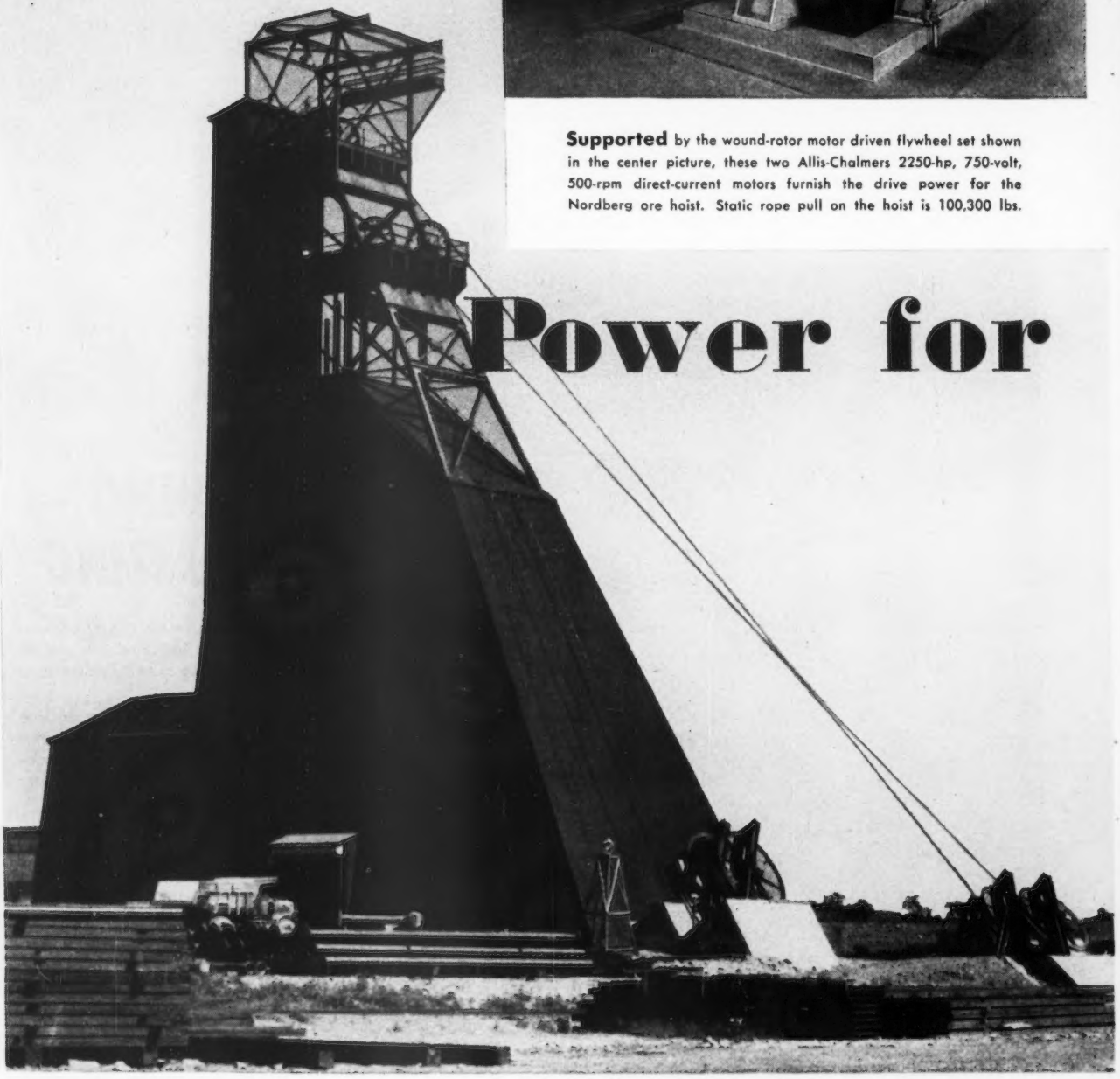
You Can't Beat An Eimco

Allis-Chalmers electrical equipment for heaviest rope pull ore hoist in the country:



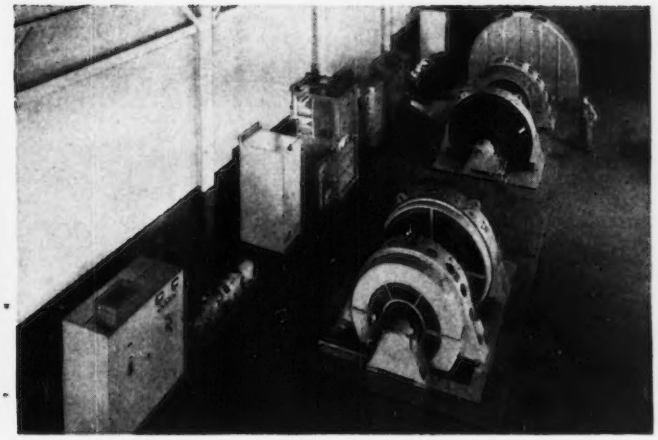
Supported by the wound-rotor motor driven flywheel set shown in the center picture, these two Allis-Chalmers 2250-hp, 750-volt, 500-rpm direct-current motors furnish the drive power for the Nordberg ore hoist. Static rope pull on the hoist is 100,300 lbs.

Power for

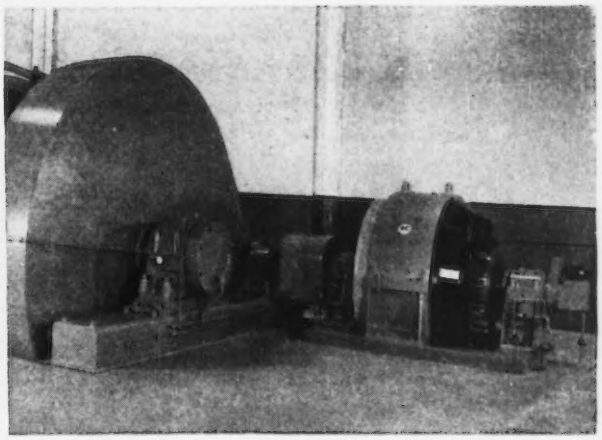


Regulex is an Allis-Chalmers trademark.

ALLIS-



Section of hoist house. The 1500-kw synchronous m-g set in foreground supports man hoist motor; 3500-kw flywheel set in background supports ore hoist motors. Controls, including *Regulex* exciter sets and liquid slip rheostat, are arranged along the side wall.



Drive power for the 12-ft double-drum man hoist is supplied by this 1750-hp, 750-volt, 500-rpm direct-current motor. The 94-inch face hoist lifts at a rate of 2000 ft per minute from the projected 5350-ft depth. Total static rope pull is 62,500 lbs.

the Long Haul

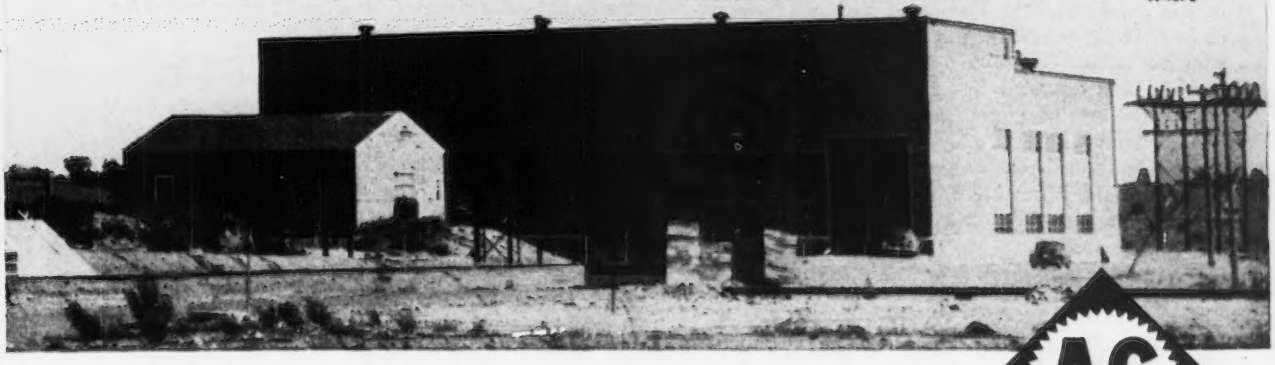
An iron mine over a mile in ultimate depth with a rope pull of 100,300 lbs is one of the projects on which millions of dollars are being spent in Upper Michigan to develop a new reserve of hematite ore for the iron and steel industry. Mining operations are expected to reach 2,000,000 tons of good grade ore per year.

Two 2250-hp dc motors and a 3500-kw supporting m-g set were supplied by Allis-Chalmers to provide the power for a 15-ft diameter, 98-inch face, double-drum ore hoist with two skips in balance. Each skip weighs 18,000 lbs and carries a load of 15 long tons, or 33,600 lbs per trip ... at a rate of 2400 ft per minute from any level.

Allis-Chalmers also furnished this installation with controls, motor and supporting m-g set for a double-drum man hoist. Operating two cages over a mile deep, this hoist carries material loads up to 20,000 lbs, and man loads to 10,000 lbs at a speed of 2000 ft per minute.

Profit by the years of Allis-Chalmers experience in the mining and ore processing field. For further information contact the A-C office nearest you, or write to Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4378



CHALMERS

A-C ALLIS-CHALMERS

"Here's Good News for us Blasters..."

We have always claimed that Primacord is not affected by stray currents and cannot be set off by friction, sparks or ordinary shock. But lightning! . . . no one knew what lightning would do . . . until now!

The incident took place on a pipe line job in Kentucky. Primacord branch lines were hooked up to the trunk, but the detonator had not been attached. The crew left the job when the thunderstorm warning came – and when they returned they discovered that lightning had struck the Primacord in two places, but had failed to detonate it. About six feet of trunk line was gone, and the free ends appeared to have been melted off. The branch line Primacord from four holes, previously tied into the trunk, were also burned off to the collars of the holes. Another burned out section of the trunk line, about two feet long, was found twelve feet away.

New lengths of Primacord were tied onto the trunk and branch lines, and the blast was shot when all was ready.

This is good news for blasters – especially during the thunderstorm season, or where high voltage electrical equipment is on the job. P-16

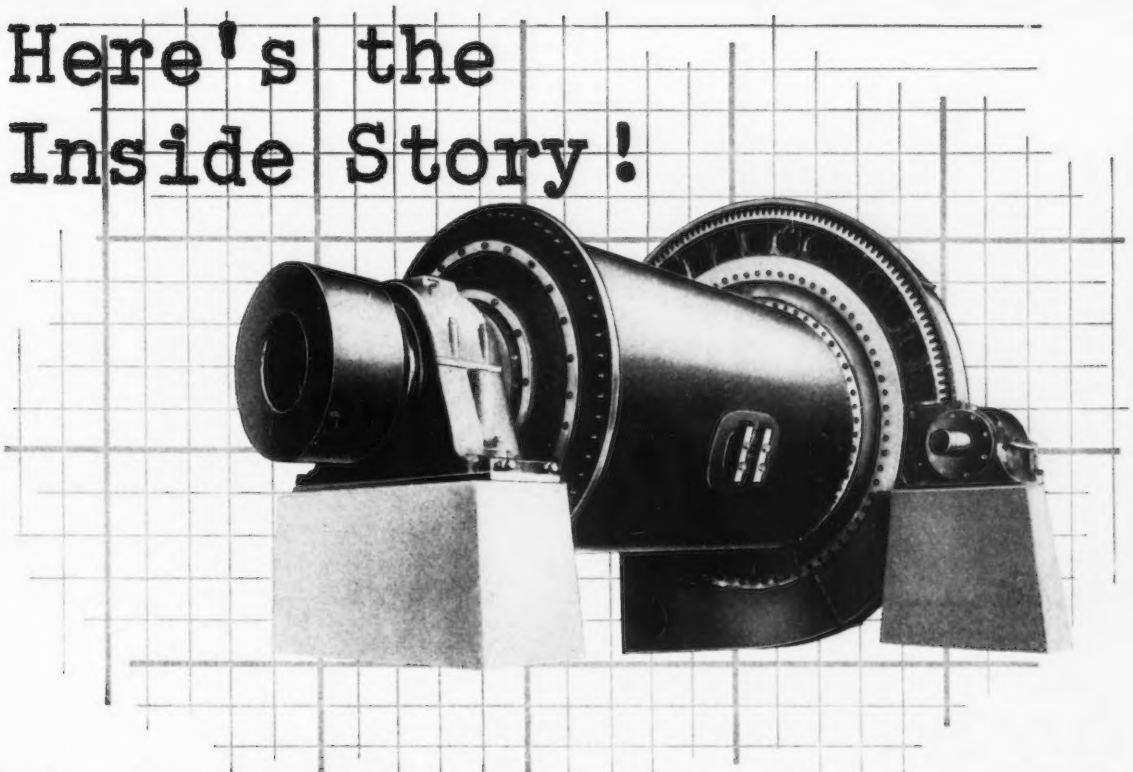
Ask your explosives supplier or write for further facts to

THE ENSIGN-BICKFORD COMPANY
Simsbury, Connecticut
Also Safety Fuse since 1836

PRIMACORD® *detonating fuse*

PROVED and APPROVED

Here's the Inside Story!



It's the Design of Traylor Grinding Mills that improves quality...reduces operating costs

Every Traylor Grinding Mill is individually engineered and built to fit your own particular needs. As a result each mill delivers a uniform product . . . of the right fineness *for you*.

All main bearings on Traylor Ball, Rod and Compartment Mills are pressure lubricated. A high pressure pump coats each trunnion with a film of grease which lifts and floats the mill to overcome high starting torques and eliminates undue wear caused by "dry" starting.

Precision cut steel driving gears, trunnions cast integral with the detachable heads, shell liners of manganese or alloy steel . . . all indicate the improved design and construction features that are standard with Traylor.

A **Traylor** LEADS TO GREATER PROFITS

Illustrations and specifications on Traylor Grinding Mills will complete the "inside story" for you. Mail coupon for Bulletin 8121 today.

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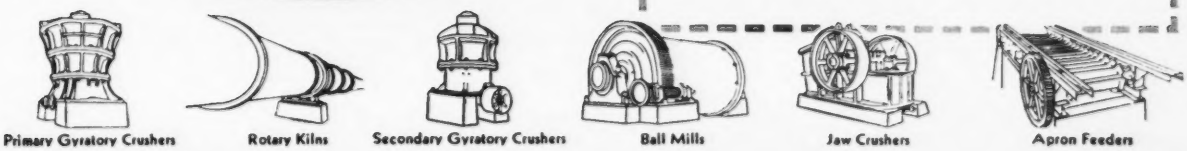

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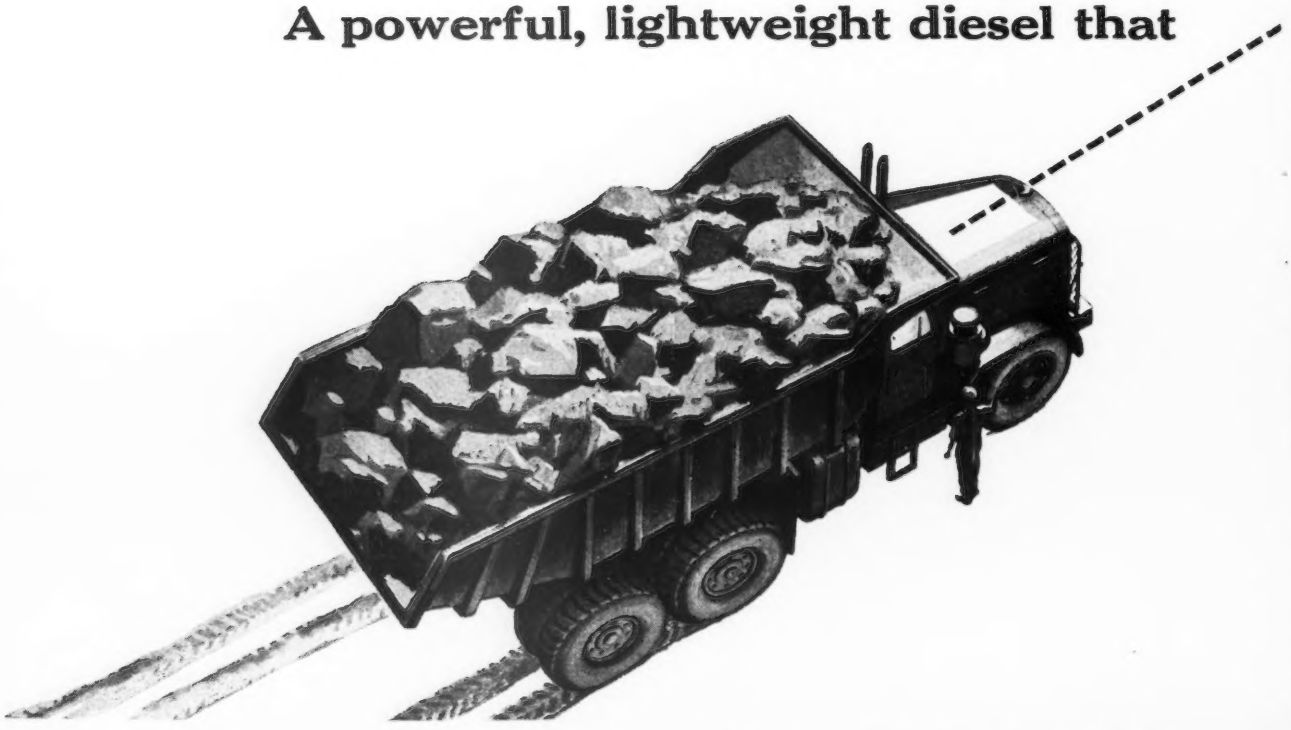
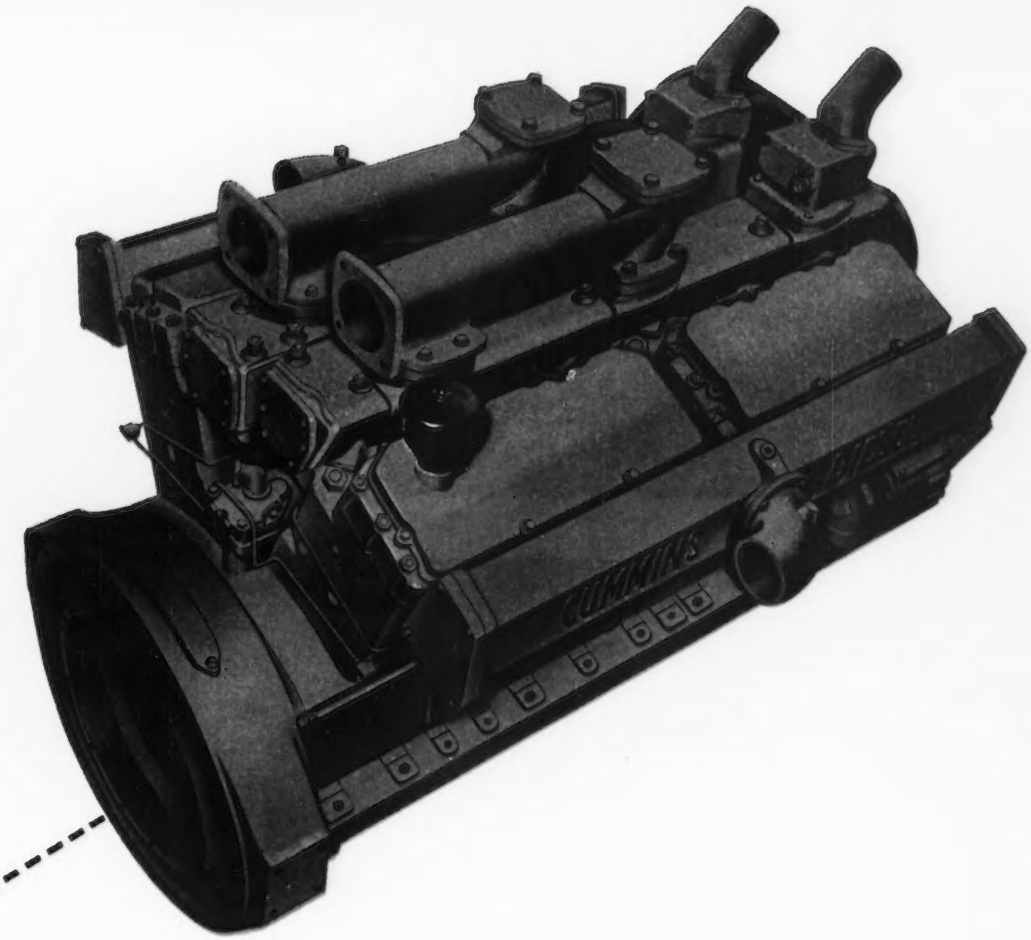
The Cummins answer to the trend toward bigger and faster equipment

A powerful, lightweight diesel that





moves more payload per shift

Cummins modern 12 cylinder V-type diesels anticipate needs of the future. They include the 400 h.p. NVH-1200, the 550 h.p. NVHS-1200, and the 600 h.p. turbocharged VT-12. Powering trucks, shovels, locomotives, and other heavy-duty equipment, these rugged units get more done per shift by handling bigger loads faster, at less cost. You can get specifications by calling your Cummins dealer or equipment representative.

CUMMINS **Cummins** Engine Company, Inc. • Columbus, Indiana

Leader in rugged, lightweight, high-speed diesels (60-600 h.p.)

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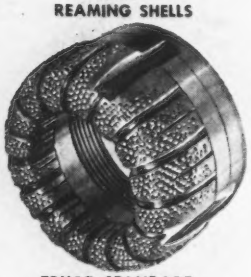
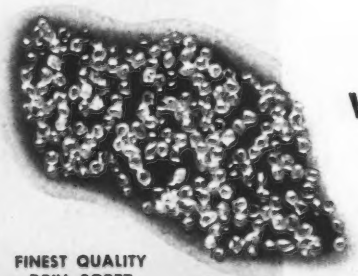
TRUCO REAMING SHELLS



TRUCO STANDARD OIL FIELD BIT



FINEST QUALITY DRILL BORTZ

"Sell it and make your fortune Mynheer Van Niekirk"

It was the year 1876. Free America was 100 years old and there were great celebrations in Philadelphia. In London, Queen Victoria was proclaimed Empress of India.

In South Africa, children playing by the Orange River found a bright pebble, too pretty to throw away, but when trader Van Niekirk offered to buy it they shouted with laughter and told him to sell it and make his fortune.

But, nobody wanted to buy the pebble so Van Niekirk dropped it in an envelope and mailed it to a government agent who declared it to be a diamond of 21 carats. Then, the governor of the Colony bought it for five hundred pounds and sent it to the Paris Exhibition as a curiosity.

Nobody paid much attention, but this was the first clue to the existence of the diamond fields that would one day pour out fabulous treasures in gems—and in industrial diamonds, those incomparable cutting points which are the vital time-saving, cost-reducing element in Truco Diamond Bits.

With Truco Diamond Bits you get irresistible cutting power in any formation; swift, accurate penetration that reduces rig time and pays off handsomely in cash savings. May we send you our Truco Diamond Bit Catalog?

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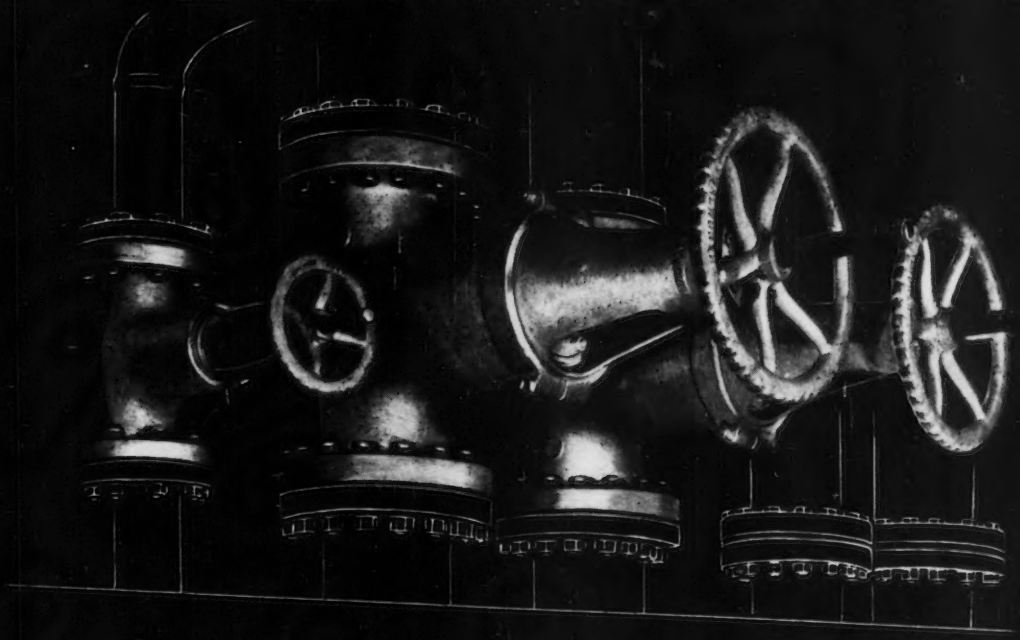
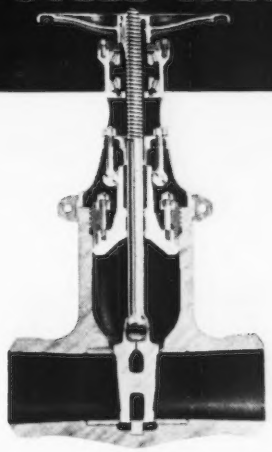


PRESSURE-SEAL CAST STEEL VALVES



Better because ... **They have no bonnet flanges, bonnet bolts, or bonnet welds. Ideal for high-pressure, high-temperature steam service and corresponding boiler feed service, Walworth Pressure-Seal Cast Steel Valves weigh less, and take up less space than the flanged bonnet type of valves used for similar services.**

These are a few of the important advantages made possible by the design of Walworth *Pressure-Seal* Cast Steel Valves. Internal line pressure is utilized within the bonnet to maintain a tight, leakproof, body-to-bonnet connection under all normal operating conditions. The higher the pressure, the tighter the seal.

Ask for your copy of Walworth Circular 143. It gives detailed information, including sizes, dimensions, and specifications for all Walworth Pressure-Seal Cast Steel Valves.

Cross section of 8-inch Series 900 Walworth Pressure-Seal Cast Steel Gate Valve. Pressure-Seal Globe, Check, Angle, and Non-Return Valves are also available in Series 600, 900, 1500 and 2500 in a wide range of sizes.

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valves . . . pipe fittings . . . pipe wrenches

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CAMERA-EYE EVIDENCE OF THE

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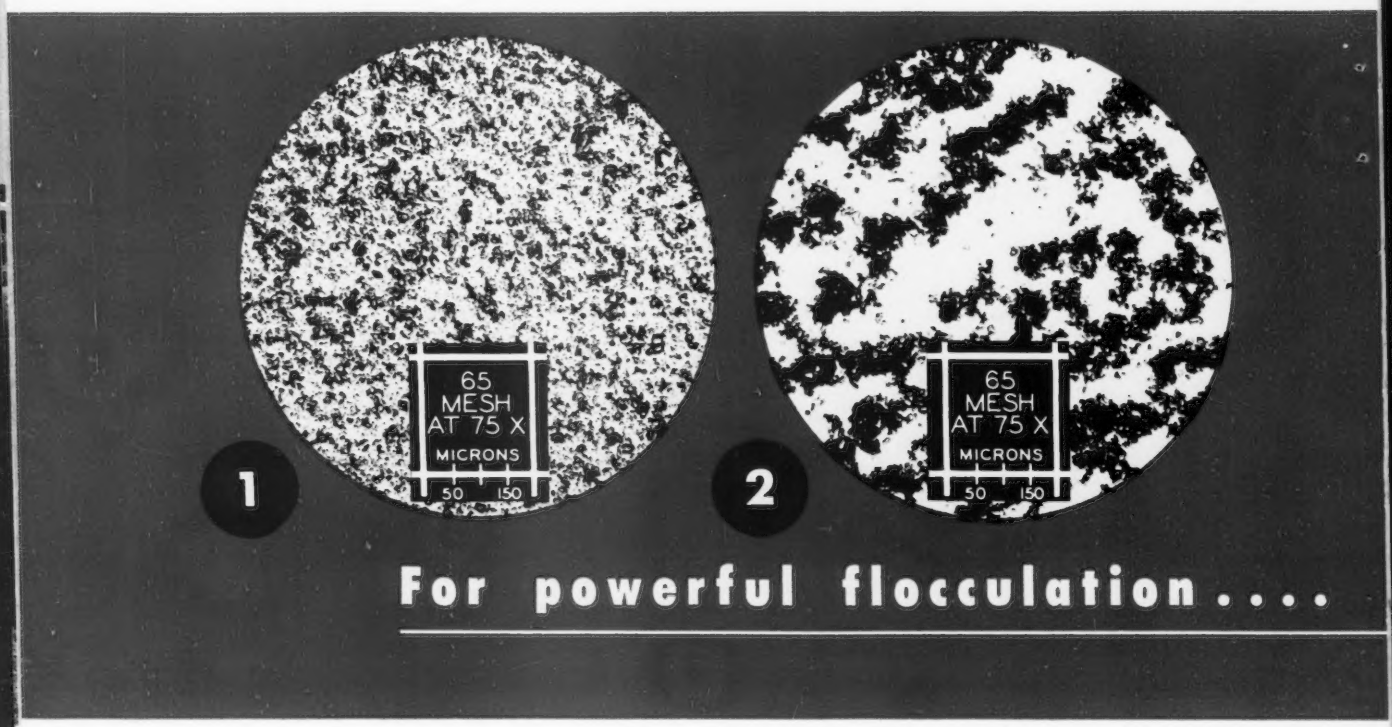


For powerful flocculation....

Photomicrographs show tungsten slimes in dispersed form (Fig. 1), and in flocculated form (Fig. 2) after the addition of only 0.08 lb. AEROFLOC per ton of dry solids. On opposite page, Figure 3 shows 10% solids slurries of these slimes in 1000 ml. graduates, with the addition of AEROFLOC 552 at the rate of 0.08 lb. per ton being made at the right.

Figures 4 and 5 (taken one minute and ten minutes later) demonstrate the incredibly fast settling action of the AEROFLOC Reagents.

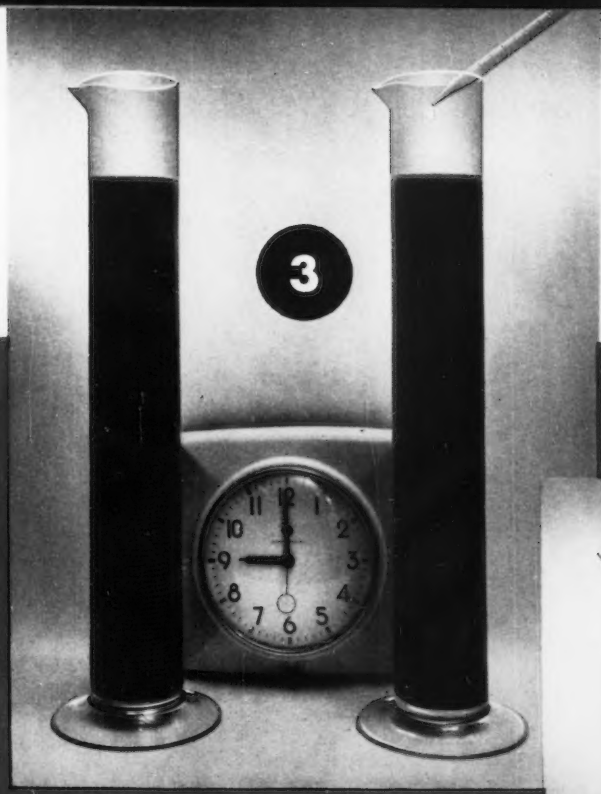
Two Cyanamid AEROFLOC Reagents are in commerical use in plants treating precious-metal, base-metal and non-metallic ores and coal. AEROFLOC Reagents speed-up and effect more complete settling of both valuable concentrates and plant tailings, thereby conserving values previously lost to thickener overflow or reducing solids content of plant effluents.

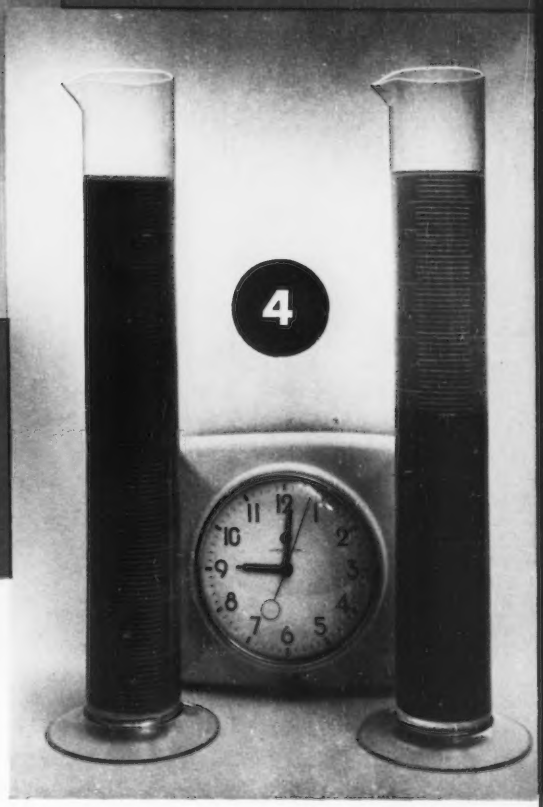
As a filter aid in operating plants, AEROFLOC Reagents increase filtration rates, make filter cakes firmer and more porous, help to prevent blinding of filter cloth and increase washing ease and efficiency.

In new and existing plants AEROFLOC Reagents can reduce capital expenditure by increasing the capacity of existing thickening and filtration installations, or reducing size of new units required.

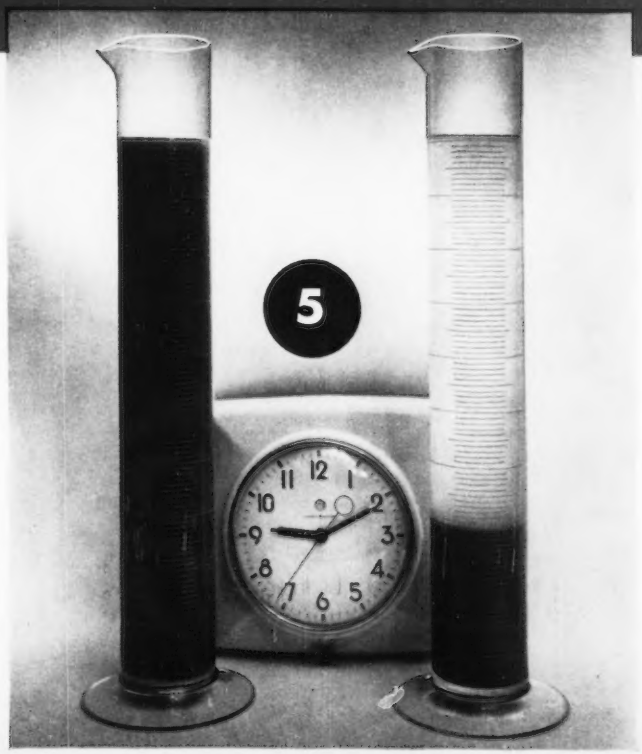
Cyanamid Field Engineers will be happy to work with you in your mill on the application of AEROFLOC Reagents to your particular settling and filtration operations.

AMERICAN Cyanamid COMPANY





to settle slimes *quickly*



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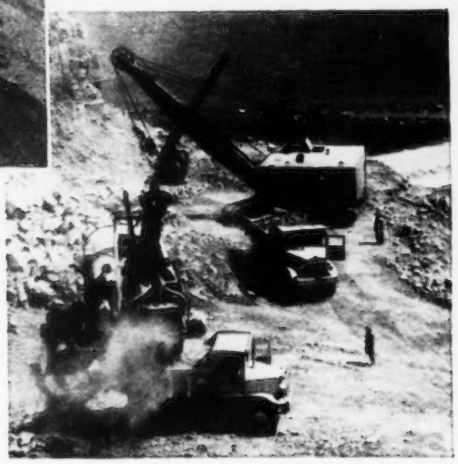
MINERAL DRESSING DEPARTMENT 30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y.

LIMA Type 2400 dragline stripping overburden at open cast coal site in Northern England.

Two LIMA Machines working on harbor construction project in Aden.



George Wimpey & Company, Ltd. report:

"We purchased our first **LIMA** in 1947. Today we rely on **50 LIMAS** in United Kingdom, Aden, South Africa and Borneo"

Large Lima excavators and cranes are standard equipment now for George Wimpey & Company, Ltd., one of the United Kingdom's largest civil engineering contractors. Ten Lima type 802's, thirty-three 1201's and seven 2400's are moving about 10,000,000 cubic yards yearly for Wimpey. Their diverse, world-wide operations include stripping overburden at open cast coal sites in the United Kingdom, harbor and refinery construction in Aden, dam building in South Africa and pile driving in Borneo.

After their first machine in 1947 proved very satisfactory, Messrs. Wimpey decided to standardize on Lima machines for all large excavators not made in the United Kingdom. This standardization has benefited them two ways:

1. Lima machines have given Wimpey the reliability and high output required for continuous, economical operation.
2. Uniformity and ready availability of replacement parts throughout the world, have avoided costly delays due to idle equipment.

It will pay you, too, to standardize on Lima for shovels, cranes and draglines.

BEFORE you buy any machine, **COMPARE** carefully all important features **LIMA** offers you:

1. Bronze bushings in tread, idler and drive rollers are protected by piston-ring type dirt seal rings and retainers.
2. All gears, smaller parts and shafts which are subject to extra wear are flame or induction hardened for longer life.
3. Main machinery is placed well back of center of rotation to eliminate excess counterweight.
4. Anti-friction bearings, used at all important bearing points, reduce destructive friction, fuel consumption and lubrication requirements.
5. Big capacity drums and sheaves lengthen cable life by reducing the need for double wrapping and sharp bends in cable.
6. Machine cut propel and swing gears and roller chain power take-off are enclosed in a sealed oil bath for dirt elimination and smoother, quieter operation.
7. Torque converter (optional) automatically adjusts speed to load requirements, minimizing shock loading, making performance smoother and faster. (Standard on Type 2400 shovel).
8. Full air controls on travel, hoist, swing and boom hoist, result in smoother, more precise operation, minimum maintenance and less operator fatigue.

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SHOVELS • CRANES
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LONGER "TROUBLE-FREE" SERVICE is the proved record of Anaconda's Securityflex SH-D Shovel Cable in mines like this, the world over.

How AnacondA SH-D Shovel Cable helps keep downtime DOWN

A cable breaks. A shovel lies idle. Production time and profits slip away.

One break in a cheap cable can more than wipe out savings made by buying on price alone.

A far wiser buy is Anaconda's improved Securityflex* Type SH-D Shovel Cable. This rugged cable is built to keep downtime down!

Why mine superintendents praise it

A new, high-grade butyl insulation withstands heat, moisture and ozone. New neoprene jacket is tougher and more abrasion resistant. Rubber cores cushion the ground wires . . . help prevent breaks.

Run Securityflex Shovel Cable over rocks—if you must. See how it holds up. Securityflex is flexible . . . easy to handle . . . safer . . . less liable to "blow-out."

Try Securityflex in your mine

Securityflex Type SH-D Shovel Cable has a proved record of safety and economy in mines all over the world. Chances are it can cut downtime and costs in *your* mine, too. See your Anaconda Sales Office or Distributor for further information. *Anaconda Wire & Cable Co., 25 Broadway, N. Y. 4, N. Y.*

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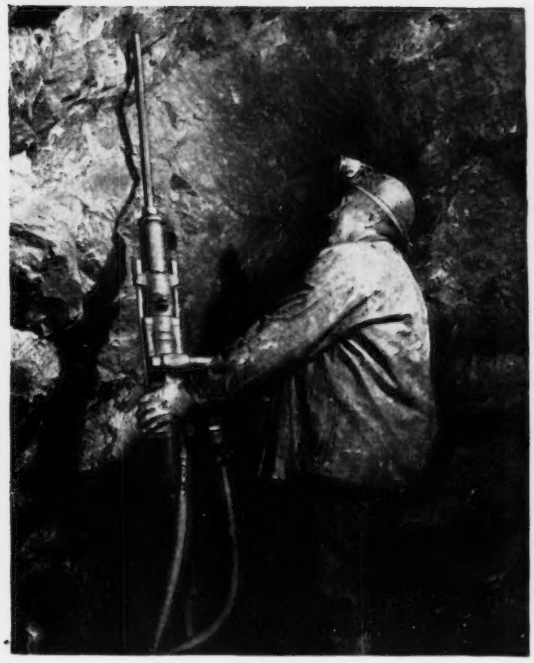
ANACONDA®

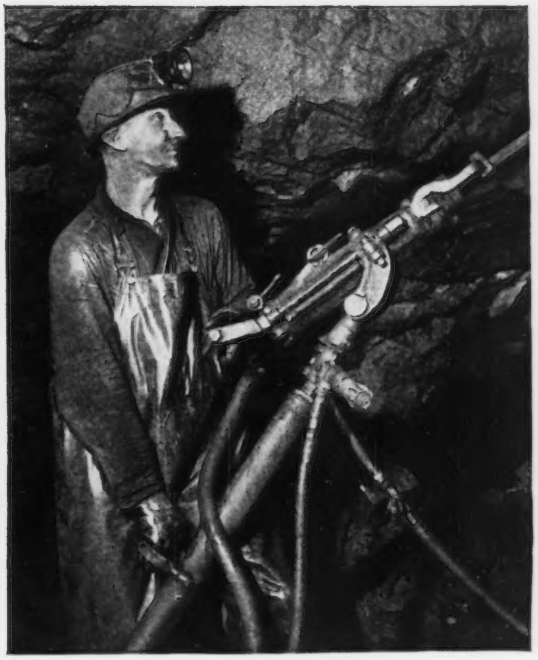
Flat-twin cables for shuttle cars, continuous miners, loaders, cutters, drill trucks. Hi-volt cables for mine power • Type SH-D for shovels • Type SO and heavy-duty drill cords for hand drills, remote control • trolley wire • feeder cable • telephone wire • shot fire cord • welding cables.

Ideal for Softer Rock Formations – the new CP-555 Rotauger's fast, powerful rotary drilling motor and its entirely independent rotary feed motor combine to more than double your footage in the softer formations. And its short overall length permits set-up in restricted quarters. Available for wet or dry drilling, it drills 2½ inch holes in speeds of 2 to 4 feet per minute to depths of 100 feet or more.

Whatever the job— there's a CP to drill it!



Ideal for All Overhead Drilling—the well-balanced CP-34 Stoper gets more advance every raise round. Because it has just the right piston speed, foot-pound blow, rotating speed and feed pressure it gets the most service and footage out of Tungsten Carbide Bits. A ratchet-type twist throttle on the holding handle affords fine control of feed-leg pressure. Button that provides instant safety release for feed-leg pressure is standard; rotation release optional.



Ideal for Tungsten Carbide Bit Efficiency—the CP Airleg takes constant recoil shock in its stride—holds drill firmly to the work. Exclusive pressure release type control handle maintains a pressure balance that compensates for line pressure variations and changes in rock formations . . . the steady bit pressure that results prevents "slapping" and minimizes bit breakage. Available with steel or aluminum alloy feed cylinder and with 36″ and 48″ feed travel.

The CP Airleg makes an ideal combination when teamed up with CP-32A and CP-59 Sinker Drills. The valve design of CP Sinker Drills maintains high drilling speed and economy of air. Fully cushioned for low maintenance, they're available for wet or dry drilling.

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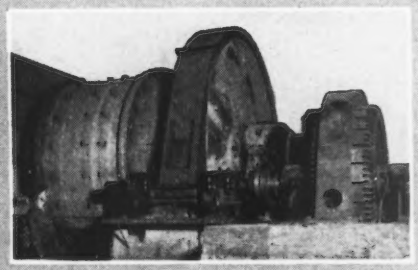
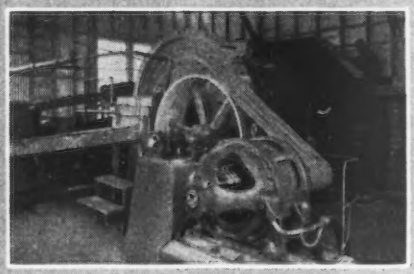
how MARCY MILL leadership in mechanical performance can help you cut costs

Grinding mills are selected on the basis of low-cost-per-ton output resulting from efficient, dependable mechanical and metallurgical performance. That's why so many successful mining companies throughout the world continue to order **and reorder** Marcy* Grate Discharge Ball Mills and Marcy Open End Rod Mills.

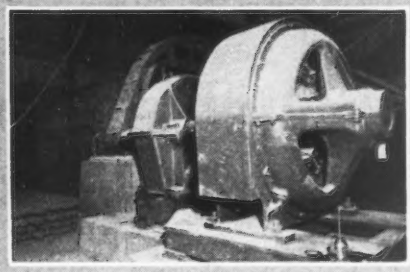
for example...



Direct connected drive with flexible coupling



V-belt drive.



Speed reducer drive.

DRIVES AND GEARS

- the types of drive and gears used are custom-engineered for each Marcy Mill to assure dependable, continuous operation and long, trouble-free operation... one of the many Marcy Mill features which result in low-cost-per-ton production.

- **drives may be**

  direct connected with flexible coupling using cut tooth single helical or herringbone steel gears.

  flat belt, V-belt or speed reducer drive with meehanite cut tooth spur gears.

  variable speed drives for special applications.

- single helical and herringbone gears are made to American Gear Manufacturers Association recommendations as to tooth shape, size, material specifications, etc., assuring long life and efficiency. This, combined with precision gear cutting, provides an extra high service factor.

*BOTH MARCY AND MASSCO ARE REGISTERED TRADEMARKS.

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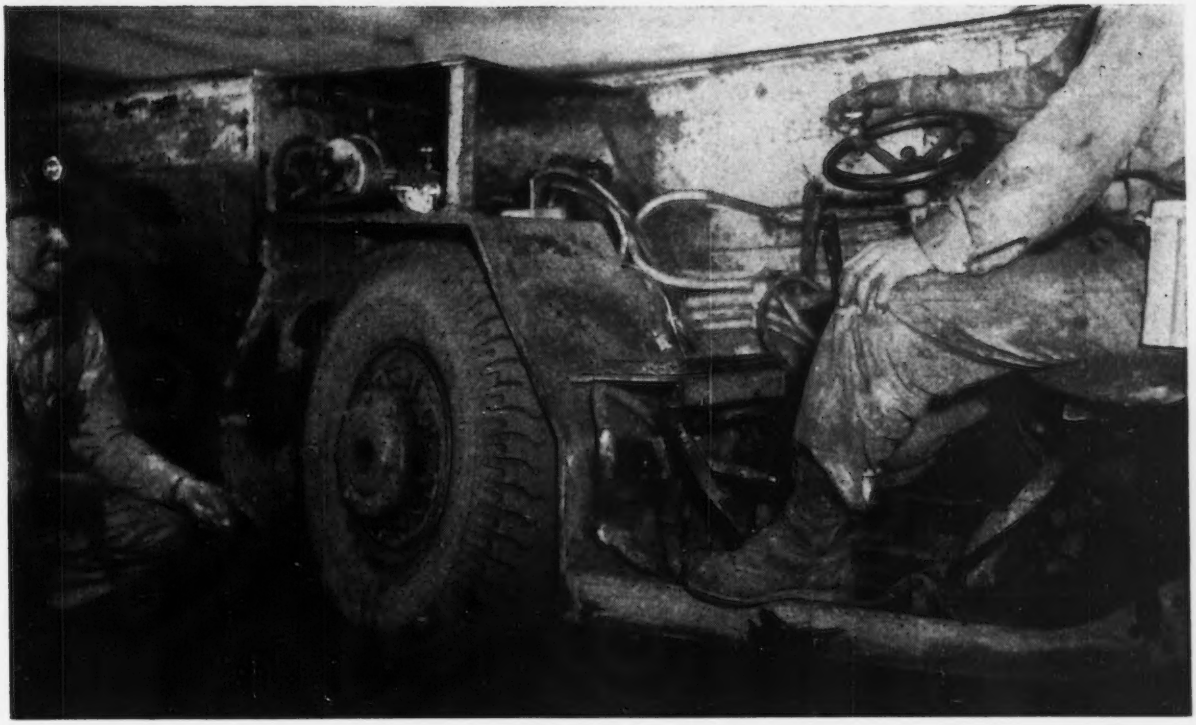


Tires speed preparation of 200 rail cars of coal per day

CLINCHFIELD COAL CORP., operates the Moss Mine in the southwestern part of Virginia. Here enough bituminous coal to fill 200 rail cars every day is mined, screened, washed and dried. Keeping the whole process on schedule is the job of the tires on shuttle cars and hauling trucks.

Tire trouble used to be a major problem, Assistant Superintendent C. T. Dahlin reports; but 3 years ago the company switched to B. F. Goodrich tires, now reports their tire problems licked. Traction Express tires (above) on shuttles operating underground carry 7-ton loads, wear almost indefinitely because the tread is up to 46% thicker than that of a regular tire.

The patented nylon shock shield under the tread of all B. F. Goodrich off-the-road tires protects the cord body from shocks and bruises. Strong nylon cords stretch together under impact, give you this 4-way saving: (1) more recappable tires and more miles per recap (2) more original hours of service (3) increased bruise resistance (4) less danger of tread separation. You pay no more for the money-saving nylon shock shield.

Stop unnecessary tire trouble now, start saving tire dollars. See your BFG retailer. His address is listed under Tires in the Yellow Pages of your phone book. Or write *The B. F. Goodrich Company, Tire & Equipment Division, Akron 18, Ohio.*

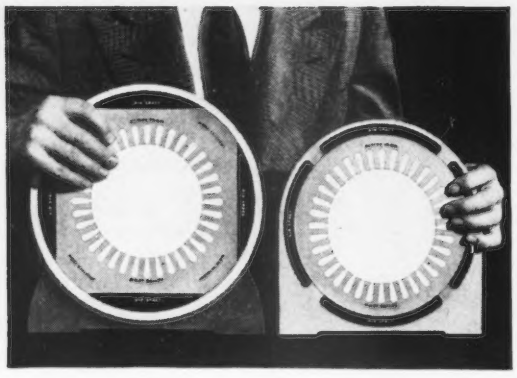
TRUCK HAULS 15 tons of gob to dump. Universal tires resist skidding and slipping on steep grades. Husky, wedge-shaped cleats give full traction in both directions.

UNIVERSAL TIRES have given such excellent service that Clinchfield has been able to recap them. Former tires often wore out after 30 days' service in wet weather.

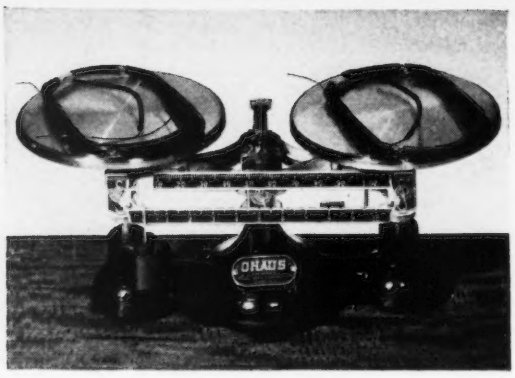
Specify B. F. Goodrich tires when ordering new equipment

RESEARCH KEEPS B.F.Goodrich FIRST IN RUBBER

Here are laminations from two 5-hp Life-Line motors. Note that only the inactive support corners of the original Life-Line square stator have been eliminated from the round stator of the Life-Line "A" motor.



When the stators are placed in their respective frames we see how the Life-Line "A" size reduction has been accomplished without sacrificing active magnetic steel. Excess air space has been eliminated also.



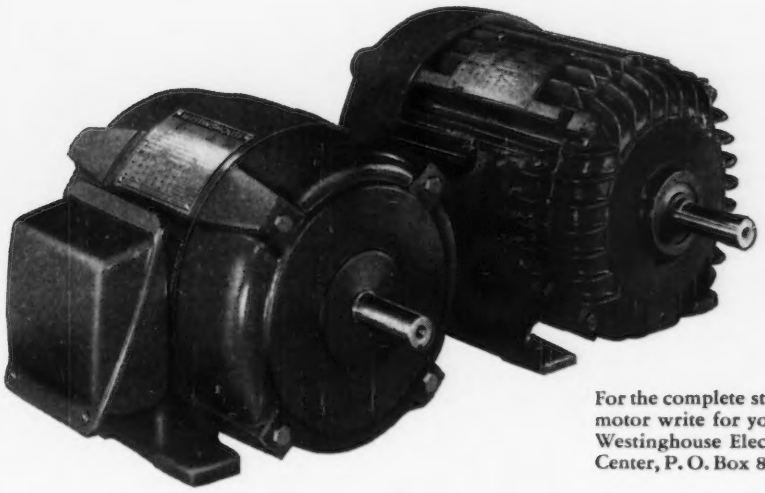
Copper, the other important active material, has not been sacrificed. The coil on the left is from an original Life-Line motor. The coil on the right is from a new Life-Line "A" motor. Both weigh the same.

Here's how more horsepower has been put in the Life-Line A motor

These demonstrations show how motor performance is determined by "active" material

Perhaps you are a motor user who has raised the question: "How can you shrink the size of a motor and still equal or better the original performance?" Let's look inside a motor to find the answer.

The performance of any motor is dependent upon its active material—the magnetic steel and copper. Take the original Life-Line® and the new Life-Line "A" for example. The amount of magnetic steel in the stator and rotor and the copper in the coils of both Life-Line designs are the same. The reduction in size has been accomplished by eliminating inactive material and space. Thus you have a smaller motor whose basic electrical performance remains unchanged. In fact, the Life-Line design principle has been proved in service for over seven years. J-21848



For the complete story on the new Life-Line "A" motor write for your copy of Booklet B-6154. Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa.

YOU CAN BE SURE...IF IT'S

Westinghouse

STURTEVANT

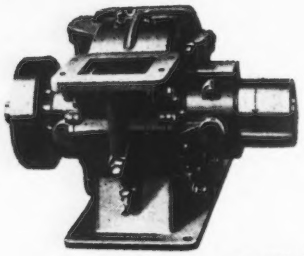
Laboratory Equipment...

assures accurate samples... cuts laboratory sampling costs

Sturtevant laboratory equipment have all the features of full-sized production machines with extra accuracy and wider range of adjustment built-in. They are fast... provide true samples of every batch processed.

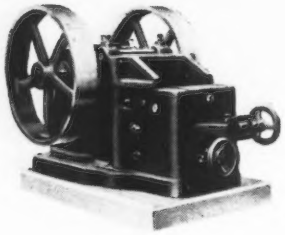
All Sturtevant machines have "open-door" accessibility which permits quick, thorough cleaning... prevents the possibility of previous batches from contaminating new samples. Their rugged construction assures round the clock operation with practically no maintenance.

Investigate Sturtevant equipment for your laboratories. They will help you cut sampling costs... improve product quality... increase sales. Write for catalog, today.



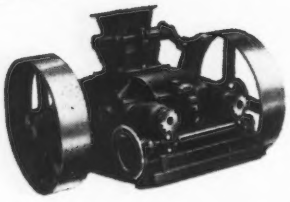
LABORATORY SWING-SLEDGE MILLS

Capable of reducing soft, moderately hard and tough or fibrous materials to any degree of fineness between 1 in. and 20 mesh. The patented "Open-Door" feature permits ready accessibility for cleaning.



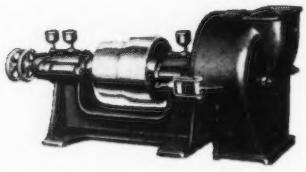
LABORATORY JAW CRUSHERS

Special Roll Jaw action simplifies close regulation of the product with capacities varying from 300 to 400 lbs. per hour at finest settings, to 1000 or 2000 lbs. when opened for coarser work. Each part of the crusher is accessible for quick and easy cleaning.



LABORATORY CRUSHING ROLLS

First designed especially for laboratory sampling work, Sturtevant Crushing Rolls are used regularly in many plants where there are limited out-puts. Range of output for the 8 x 5 size is from ½ in. to 20 mesh — and for the 12 x 12 size from ¾ in. to 20 mesh.



LABORATORY SAMPLE GRINDER

Laboratory Sample Grinders are of the "Open-Door" disc type and are capable of very fine work, producing products as fine as 100 mesh (coarser if desired) when working on dry, friable, soft or moderately hard materials. Simply turn hand wheel to provide product regulation from 10 to 100 mesh.

STURTEVANT MILL COMPANY

101 Clayton Street, Boston 22, Mass.

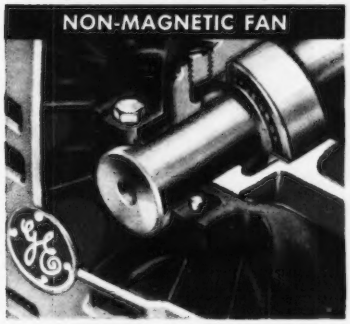
Designers and Manufacturers of

CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS • MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

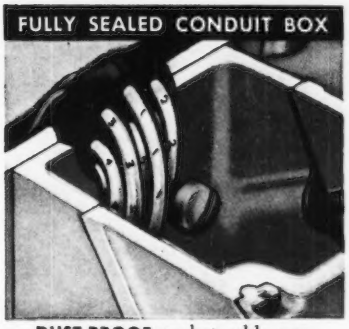
TRI 55 CLAD THE LEADER IN MODERN MOTOR DESIGN

ROTATING SEAL on the motor shaft will not attract fine taconite dust, helps keep out dirt.

NEW SEALING COMPOUND applied on the rabbet fits helps keep dust from vital motor parts.



TEXTOLITE* FAN cannot be clogged by magnetic taconite dust—resists acids and alkalis.



DUST-PROOF gasket adds protection. Big conduit box, numbered leads ease maintenance.

Built even for taconite's toughest processes . . .

G-E TRI 55 CLAD enclosed motor keeps out dust, dirt and grit!

General Electric's all-new Tri/Clad '55' enclosed motor is better sealed against dirt, grit and magnetic dust. That's why it's the ideal workhorse for difficult jobs such as taconite screening, classifying, filtering, magnetic cobbering and magnetic separating.

Here are some of the protection features that add to the life of this new motor. Cast iron end shields and frame have tightly sealed rabbet fits. A non-magnetic seal is on the motor shaft to keep fine dust out of the bearing housing. A rubber gasket protects lead entry to the stator; conduit box is also gasketed.

This protection naturally suits the Tri/Clad '55' motor to tough applications throughout mining industries. For hazardous locations, G-E Bureau of Mines approved motors are the correct choice.

General Electric Tri/Clad '55' motors are now available in many ratings. The complete line of 1 to 30 hp a-c motors will be available soon. For full details contact your G-E Apparatus Sales Office or G-E Motor Supplier today. Write for Tri/Clad '55' bulletins GEA-6012—Enclosed motors, GEA-6013—Dripproof motors, GEA-6027—Gearmotors. General Electric Company, Section 648-10, Schenectady 5, N. Y.

*Reg. trade-mark of General Electric Co.

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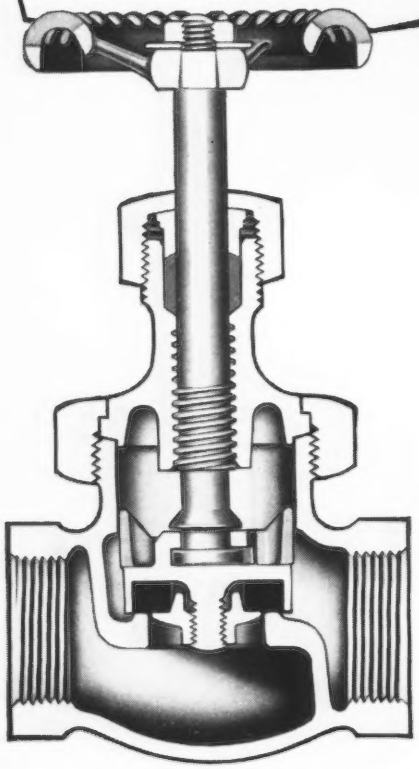
GENERAL ELECTRIC

A New Disc . . .
A "New" Valve



Crane No. 7 Brass Valves with quick-change composition disc

Save time, trouble, and money by standardizing on these Crane quality 150-Pound Valves. Simple to service. No big inventory of replacement parts. Just a few extra disc holders . . . a supply of composition discs. That's all you need for a wide variety of fluids . . . and an economical maintenance program.

The composition disc takes most of the normal wear—stands up well under ordinary usage—seats easily even on air and gas—absorbs foreign particles that might cause leakage in metal disc valves. When a leak shows up, make a "new" valve—with a new disc. Simply dismantle the union ring, lift out the trimmings, replace the disc holder assembly. Takes only a few minutes. Save the disc holder you removed—use it with the next replacement disc.

Rugged construction throughout. Sturdy bonnet joint, well reinforced by heavy union ring—can be repeatedly dismantled and reassembled. Get better acquainted with the Crane No. 7 line . . . for steam, hot and cold water, air, oil, gas, gasoline, and many other fluids.

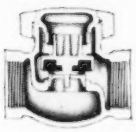
GLOBES, ANGLES, AND CHECKS

Ask for folder AD-1682R—contains full facts on the No. 7 brass valve line and the companion No. 27 check. Your Crane Representative has a copy for you—or write direct to address below.

No. 7 Globe
Sizes ⅛ to 3-inch

No. 7 Angle
Sizes ⅛ to 3-inch

Specify No. 9 for Flanged Ends



No. 27 Check
Sizes ¼ to 3-inch

THE BETTER QUALITY . . . BIGGER VALUE LINE . . . IN BRASS, STEEL, IRON

CRANE VALVES

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VALVES • FITTINGS • PIPE • PLUMBING • HEATING

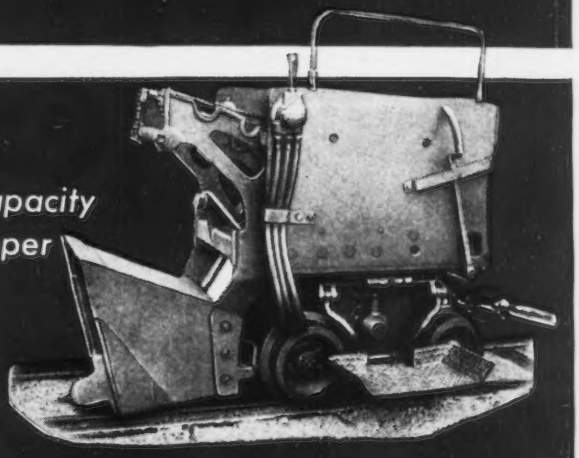
remote-controlled drills

self-propelled jumbo

Faster Drilling

with the GARDNER-DENVER JSP MOBILJUMBO

big-capacity dipper



Faster Loading

thorough clean-up

with the GARDNER-DENVER GDIO MINE CAR LOADER

SINCE 1859

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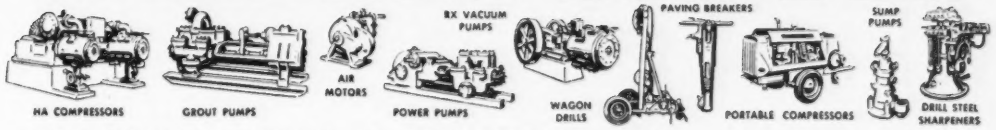

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FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois

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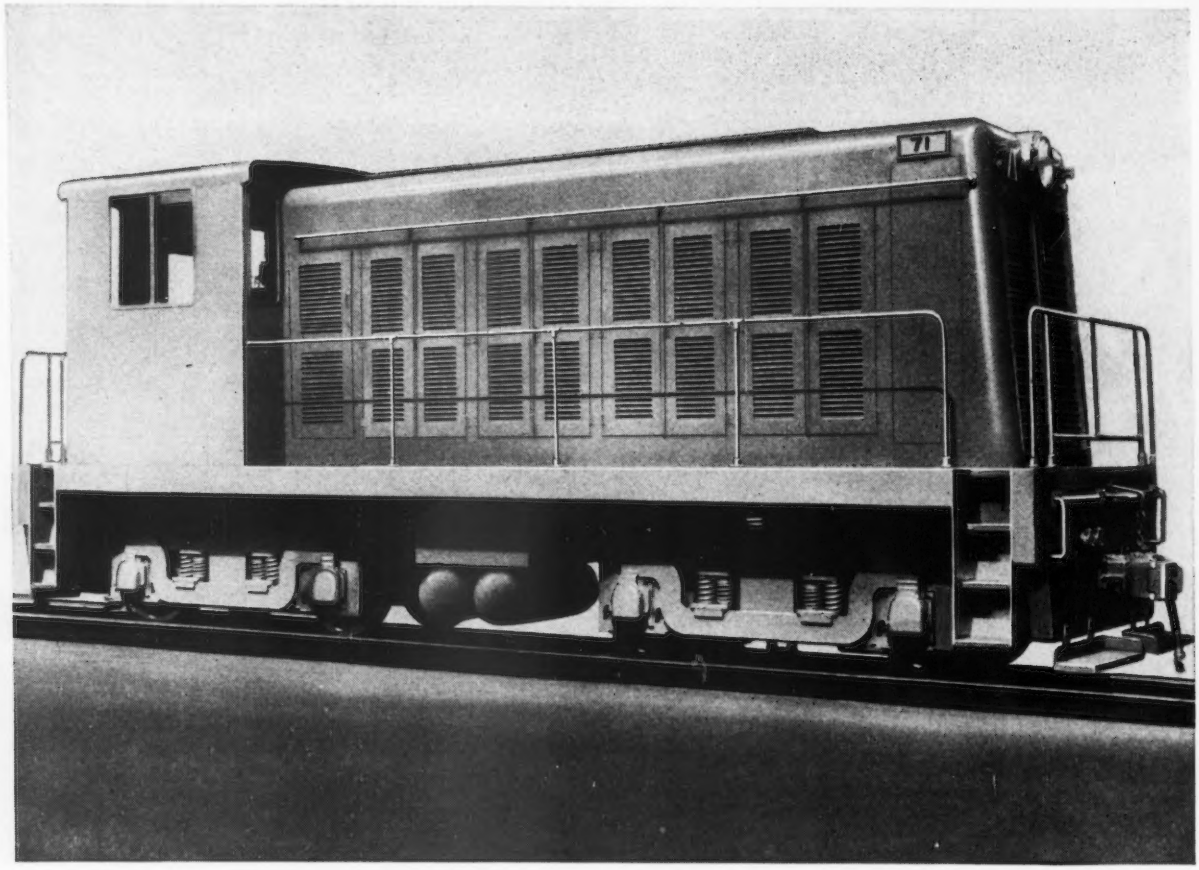

Compare before you buy any Locomotive!

The Baldwin 50 ton Diesel-Electric gives you all 15 . . .

1. Rugged design for heavy industrial service.
2. All welded steel underframe for long service life.
3. Husky Westinghouse electric equipment for hard use.
4. Easy access to engine and auxiliaries for low cost maintenance.
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13. Fully equalized spring rigging truck suspension for easy riding.
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15. Available with standard type E couplers or special couplers as required.

Add them all up and you'll see why we urge you to COMPARE before buying any industrial locomotive . . . these 15 extras are proof that Baldwins are your best buy.

WRITE—for our new booklet on the complete line of Baldwin Industrial Locomotives from 25 to 80 tons.

Address: Department 1808, Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pa.

BALDWIN BLH LIMA-HAMILTON

BALDWIN-LIMA-HAMILTON

DIESEL-ELECTRIC LOCOMOTIVES

ON 900′ HAULS

Dump in one minute — Dump time depends on amount of dirt left in 12-yd. hopper from previous load. Tournapull usually takes 1 min. to unload, can dump in 10 seconds if necessary.

D Roadster makes 3 trips to one for crawler and pan

GEORGE W. McDEARMON of Baton Rouge, Louisiana, uses his D Tournapull as an all-around utility dirtmover at his lightweight building-block plant west of Baton Rouge.

Ordinarily, the Tournapull hauls pit-run clay to the aggregate plant. Where hauls average 900′ one-way, Foreman Landry Daigle estimates the 28 mph "D" makes 3 trips to every 1 made by an 8 mph crawler and pan. Both scraper units self-load in the same pit, dump either directly into a grizzly or into a 45 x 80′ hangar-type storage shed, part of which covers the grizzly.

170′ cycle — 1 min. to load, haul, return

Material stockpiled in the shed is used whenever rain makes pit clay too wet for processing. This "inside" feeding job is handled entirely by the Tournapull. Its self-loading ability and speed enable it to keep well ahead of the 12-yd. grizzly . . . in fact, the "D" often has to take a minute to dump into the overloaded hopper. Load, haul, turn to back over grizzly and return to far end of stockpile usually takes another minute. With cycles running around 170 ft., the 7-yd. Tournapull delivers 25 loads per 50-minute hour . . . all the hopper and plant conveyor can handle.

90% efficient in 4000 hours

"Easy operation," reports Foreman Daigle, "together with speed of cycles and quick maintenance of the Tournapull, are the biggest factors in keeping our production high." With over 4000 hours on the machine, mechanical efficiency is about 90%.

Check into this 7-yd. 122 hp Tournapull for yourself. Find out what its self-loading ability and high speeds can do for you. Your LeTourneau-Westinghouse Distributor will be glad to show you job records of the "D" on both long hauls and short.

Tournapull—Trademark Reg. U.S. Pat. Off. DP-416-Q-b

LeTourneau-Westinghouse Company

PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Automatic
THESE CARS HAUL HARD ROCK!

BECAUSE the same tremendous reduction in cost per ton is available, we believe the day is soon coming when bottom-dumping mine cars will be as popular in the hard rock mining industry as they are in the bituminous coal industry today. Sanford-Day Automatic Bottom-Dumping Cars are built for all sorts of mining conditions, be it in coal, copper, gypsum, lead, zinc, iron, sulphur, salt or any other material. The sides and doors in S-D Automatics are daily taking the beating of large chunks of rock loaded from chutes. They are designed for such service!

We have spent 35 years designing automatic cars to meet every conceivable problem in mining. As a result, the bottom-dumping car is tops in the bituminous coal industry today. Certainly, hard rock miners can achieve the great economies of the automatic haulage system, too!

S-D Automatics dump and re-close automatically on-the-move, without extra labor, into any size surge bin. (The Surge Bin is the key to economical transportation of any material from mine to the plant). Normal car requirements to transport a given tonnage are usually 40% less with S-D Automatics than any other type car.

We have qualified sales representatives capable of going over your haulage system, analyzing and recommending the design to best meet your particular problem. We have engineers who have spent a lifetime doing nothing but designing mine cars. The service of these specialists are yours for the asking. Why not avail yourself of something that money can't buy! Sanford-Day builds them to haul any material.

Plan now to attend the Metal and Non-Metallic Mining Show in San Francisco Sept. 20-24. Feel free to discuss your haulage problems with our engineers and representatives at BOOTH NO. 314.

Sanford-Day IRON WORKS

KNOXVILLE • TENNESSEE

BROWN-FAYRO DIVISION
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MINE CARS, All Types - PRECISION WHEELS - "Brownie" HOISTS
CAR RETARDERS - SPOTTERS
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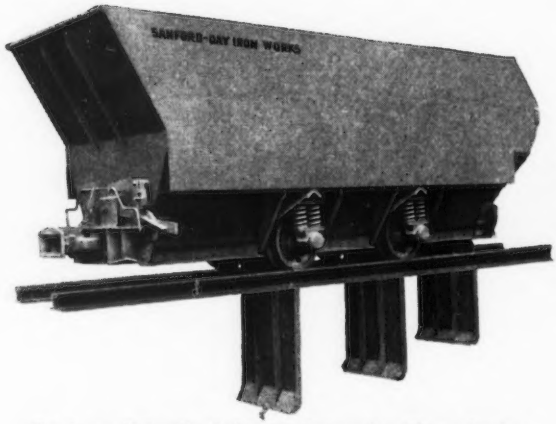
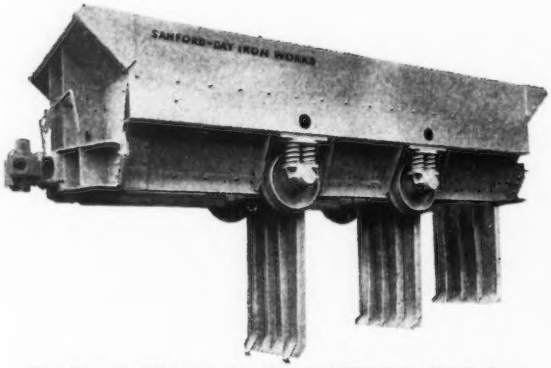
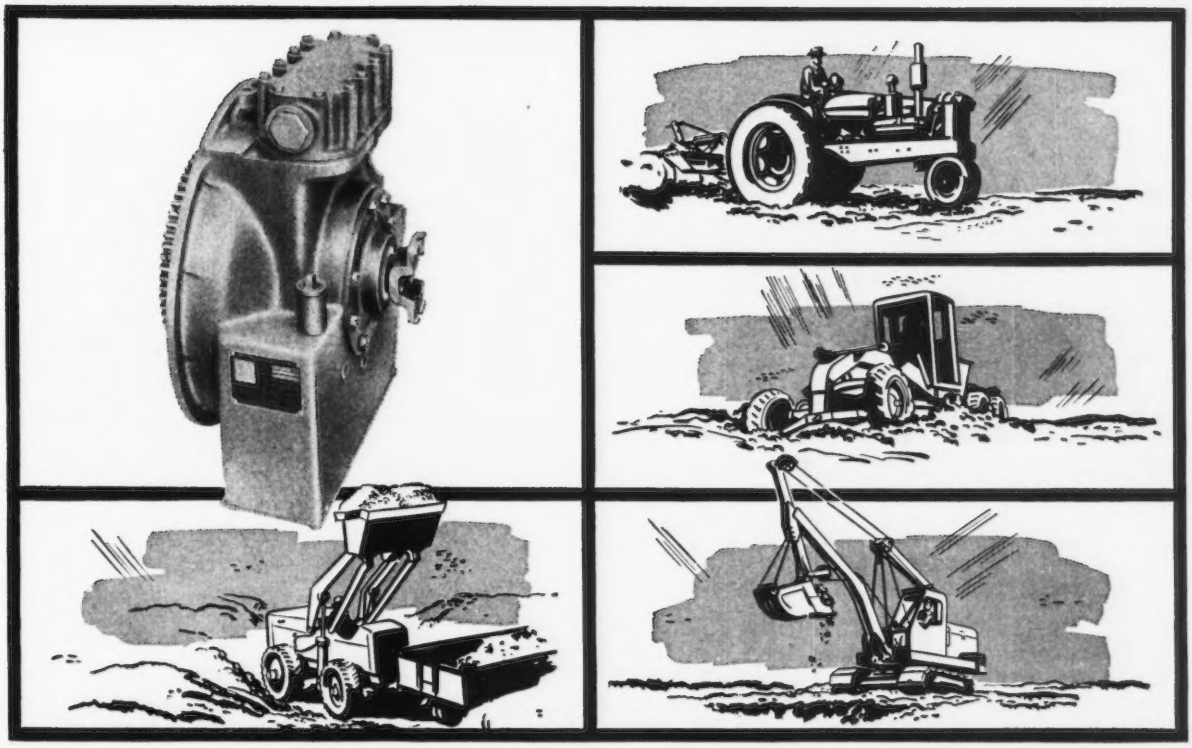


Total overall length of this S-D Automatic with overlapping ends is 15'6¼". Length of body not including overlapping ends is 12'6". (Overlapping end feature permits continuous loading without spillage between cars.) Car is 5'1¼" wide and 5'10½" high light weight. Trucks are spring mounted. Track gauge is 36". Level full capacity is 322 cu. ft.

Overall length of this S-D Automatic is 15'7¼". Length over end plates is 12' and width 5'8". Height is 30". This car was built for a 48" track gauge and has 41" door openings with 60° flare in order to shed sticky gypsum ore. Wide door openings accommodate large chunks of ore. Door plates are ½" thick with heavy stiffeners. Side plate is ⅜" thick. Level full capacity is 116.7 cu. ft.



The S-D Automatic shown above is 16'7¾" in length from center to center of couplers. Length over end plates is 13" and width 5'3". Height is 48" with light load, 47" with heavy load. This car was built for a 42" track gauge and has 60° flare slope for easy shedding of materials. Trucks are spring mounted. Doors are ½" thick with side and end plates ⅜" thick. Copper Bearing plate is used throughout. Level full capacity is 205.3 cu. ft.



NEW TORQMATIC CONVERTERS FOR GASOLINE-OR DIESEL-POWERED EQUIPMENT

★ EASY TO INSTALL
★ COMPACT
★ LOW-COST

YOUR 40- to 150-horsepower industrial and automotive engines and equipment will last longer, perform better, with a low-cost heavy-duty Allison TORQMATIC Converter protecting engines and drive lines from harmful shock loads.

And manufacturers now are offering this shock-free power transmission in their models with little or no change in equipment design.

The new Series 200-300 TORQMATIC Converters *are priced to compete* with converters designed primarily for passenger cars—*sell for less than* most comparable industrial units.

And the new *completely self-contained* TORQMATIC Converters take up little more space than conventional clutch power take-offs—have standard SAE #3 engine mountings to fit any gasoline or Diesel engine in their range.

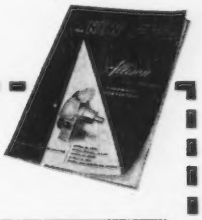
Many options, including front disconnect clutch and adapter, rear disconnect clutch adapter, standard flange, industrial shaft with or without governor drive, permit installation in a wide range of hard-working units. For full details on how easy TORQMATIC Converters are to install in your equipment, ask your equipment dealer, manufacturer or fill in the coupon and mail to:

Allison Division of General Motors
Box 894M, Indianapolis 6, Indiana

GM GENERAL MOTORS

Allison★

TORQMATIC DRIVES



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Box 894M, Indianapolis 6, Indiana

Please send me Bulletin SA 1031.

NAME_____

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What do you KNOW about your Ore Reserves?

In most cases the only way to obtain accurate information regarding the extent and quality of ore reserves is by a continuing program of properly planned

DIAMOND CORE DRILLING

and that's where we come in. For more than sixty years our Contract Drilling Department has been rendering a highly satisfactory technical service to prominent mining and quarrying companies throughout the United States and many other countries. The cores recovered not only prove the extent of ore bodies but also permit both physical and chemical examinations of the ore that will be mined and milled during the next month, the next year or the next twenty years.

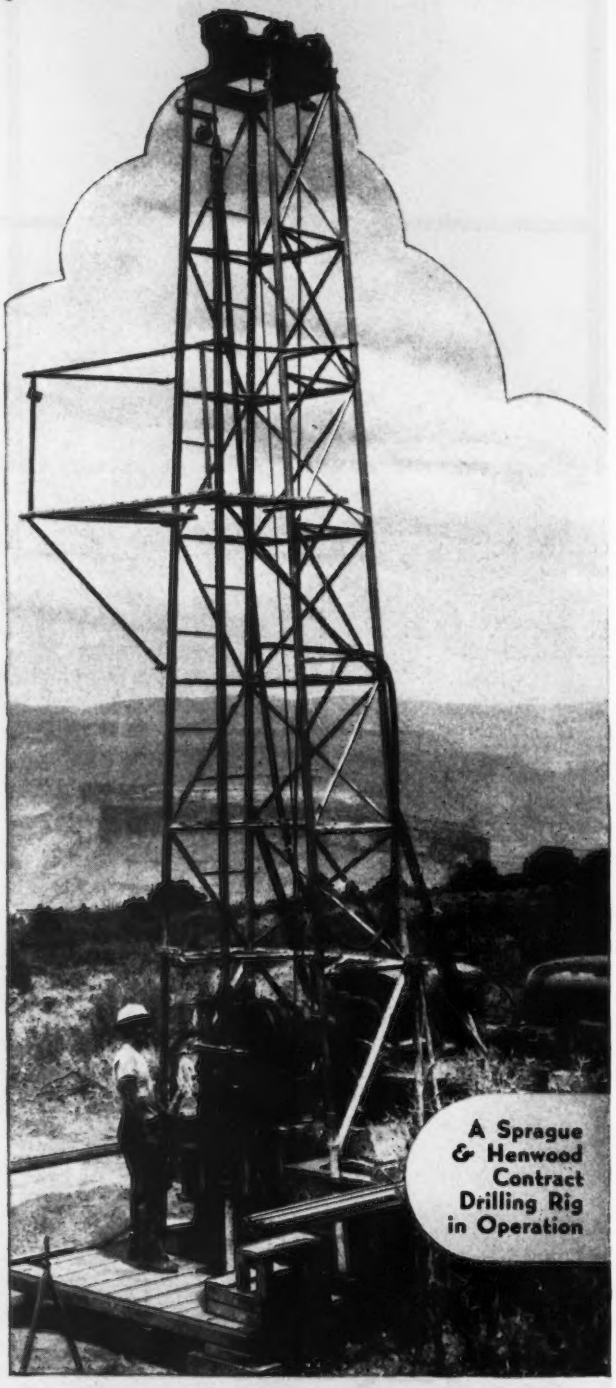
Compared to the benefits received the cost of this continuing exploratory core-drilling service is very modest and we welcome opportunities to make preliminary examinations and to submit estimates—without charge or obligation.

Sprague & Henwood, Inc.

Scranton 2, Pa.

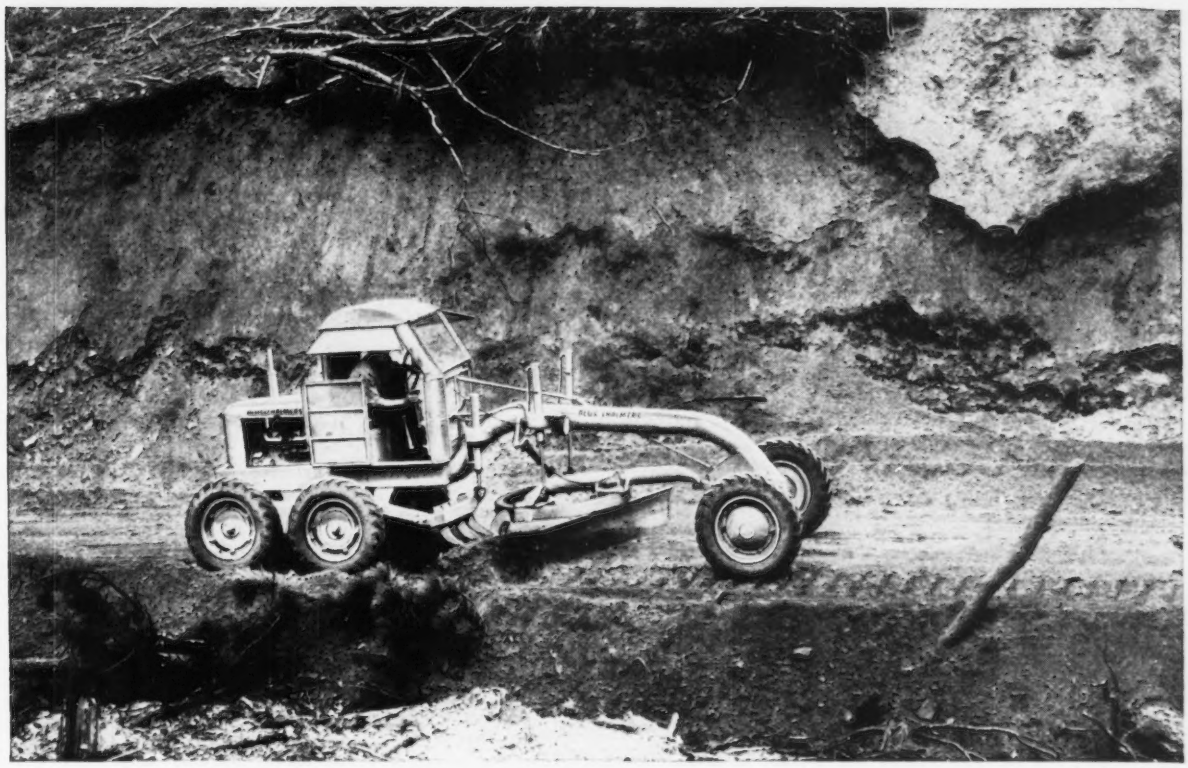
New York Philadelphia Pittsburgh
Grand Junction, Col. Buchans, Newfoundland

Manufacturers, also, of High-Speed Core Drilling Machines, "Oriented Diamond Bits" and complete accessory equipment for Core Drilling and Soil Sampling. Illustrated bulletins containing complete information mailed on request.



A Sprague & Henwood Contract Drilling Rig in Operation

The Sun never sets on Sprague & Henwood's Contract Diamond Core Drilling Operations



SMOOTHS WINTER OUT OF HAUL ROADS AT ⅓ THE COST OF LARGE GRADERS

Haul roads take a real beating—especially during the winter months. Frost boils, ruts, excessive breakup — all need urgent attention before roads can efficiently handle spring's increasing traffic.

The Allis-Chalmers Model D is tailor-made for haul road maintenance . . . yet with all its capacity to do outstanding work on large or small jobs, this versatile machine costs only one-third as much as a larger grader.

With powerful 50 brake hp. engine backed by sure-footed tandem, the Model D with ROLL-AWAY moldboard blades faster, smoother and easier — on grading and leveling, ditching and sloping, and other maintenance jobs. Its compact design allows it to keep working when trucks pass — no need to pull off the road.

For handling a variety of year-round jobs, the Model D has easily mounted attachments — hydraulic rear-end loader, scarifier, snowplow and windrow eliminator. In addition, power circle turn and leaning front wheel are also available as optional equipment.

The full story and a demonstration of the versatile Model D awaits you at your Allis-Chalmers dealer. See him soon.

Weight — 8,800 lb. (bare)
Brake hp. — 50
Speeds — four forward to 25.6 mph.
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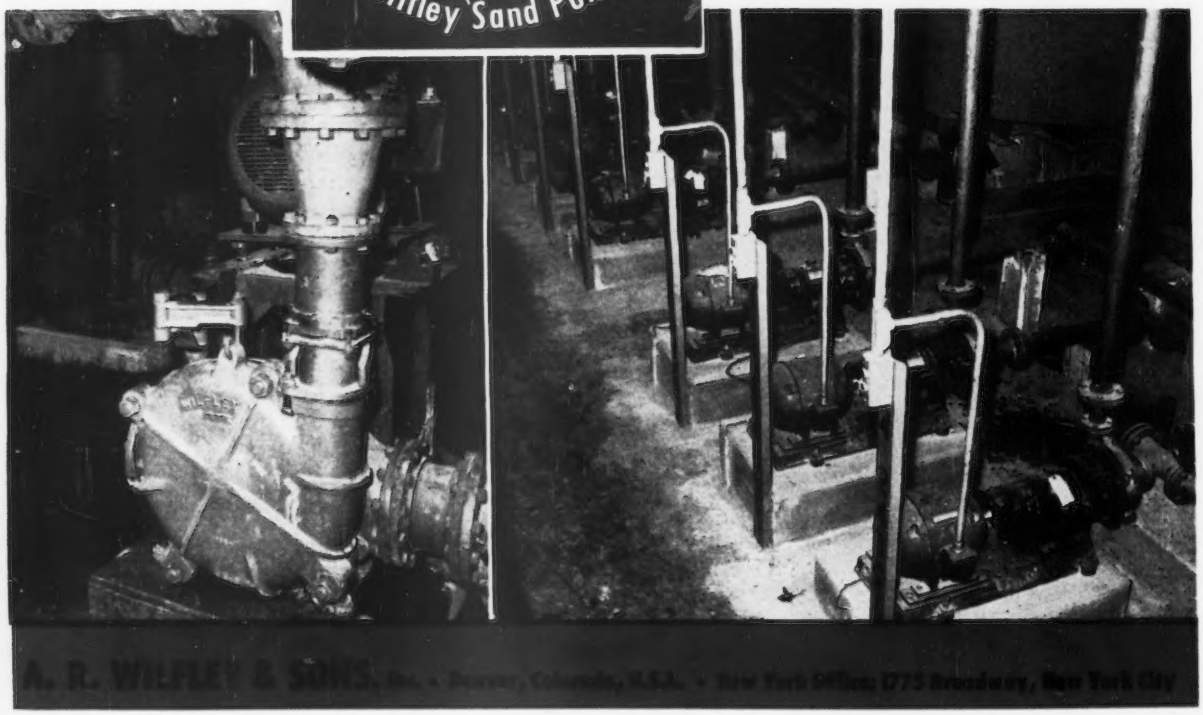

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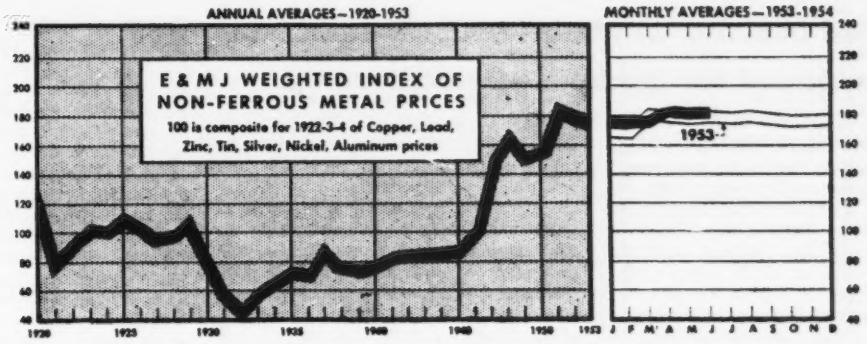
E&MJ OUTLOOK

PRICES


ANNUAL AVERAGES—1920-1953
E & M J WEIGHTED INDEX OF NON-FERROUS METAL PRICES
100 is composite for 1922-3-4 of Copper, Lead, Zinc, Tin, Silver, Nickel, Aluminum prices
MONTHLY AVERAGES—1953-1954
1953
J F M A M J J A S O N D

MARKETS

The trend in non-ferrous metals for June was moderately upward, and may well continue, although part of the rise could be traced to extra activity in preparation for the vacation the fabricating plants all take in early July.

The *E&MJ* index of non-ferrous metal prices for June moved up to 184.61 from 183.26 in May and 182.63 in June of last year. Tin, lead, and zinc were responsible, but lead later lost some ground.

Quicksilver hit a new high of $280 per flask. Production is expanding, but home producers aren't jumping output. They feel that long-range stability is hazy and the price is highly vulnerable.

Despite tough competition, steel producers advanced prices an average of $3 a ton to absorb higher costs under new labor contracts.

●

LABOR

Having largely drawn blank in a membership drive, Mine, Mill is concentrating on contract negotiations. The steel settlement, a 9c an hour package increase, spurs their hopes of pinning a like increase on the non-ferrous industry, but they'll have a tough time doing it.

●

AT HOME

The remarkable stability of business activity in general helps support the thought that the boom-bust type of business cycle is a thing of the past. Actually, consumer and industrial incomes are about as high as ever, owing to tax cuts, and there's no reason to expect a sharp decline unless industry or government do something foolish.

Add Calumet & Hecla and Idaho-Maryland to your list of new faces in uranium. Also, did you know that National Lead not only runs a uranium metal plant in Ohio, but now has charge of the AEC laboratories near Boston and is interested in the Colorado Plateau area as well.

With a new magnetometer (See p 35), a prospector may soon make airborne magnetometer surveys almost as cheaply as he can rent a Piper Cub.

A commercial sonic drilling tool is now in the advance development stage at Borg-Warner's Los Angeles laboratories.

There's no truth, say Cleveland-Cliffs officials, in rumors that a merger is under discussion with Jones & Laughlin.

Pressure on Eisenhower to avoid a boost in lead-zinc tariffs may make him turn down the Tariff Commission's recommendations.

●

ABROAD

With copper surpluses pretty well disposed of and European business picking up again, Chile's load is lightened, although a weakening peso and general unrest prove that deep-seated trouble spots aren't cured.

The world-wide tin agreement is certain of adoption despite US abstention. That's what is back of recent tin price rises.

MARKETS—Trends and Prices

Improved Demand for Metals in June—Lead and Zinc Purchased for Stockpile—Quicksilver Up

GENERAL IMPROVEMENT IN BUSINESS that set in late in the first quarter of the year continued throughout the second quarter. The record for the first half of 1954 indicates that industrial activity averaged about 10% below that of the Jan.-June period of 1953. Consumption of metals dipped to a greater extent, owing to inventory adjustments. In view of the rather sharp cutbacks in defense work, the decline was less severe than anticipated. Business placed in metals during June increased in volume, compared with May. Part of the improvement could be traced to extra activity in preparation for the annual summer vacation period at fabricating plants scheduled for early July.

Price developments during June centered in tin, lead, zinc, and quicksilver. The E&MJ index of nonferrous metal prices for June moved up to 184.61. It was 183.26 in May and 182.63 in June of 1953.

The Federal Reserve Board's seasonally adjusted index of industrial production for May was 125, up 2 points from April. The figure for June is expected to hold to the May level.

Suspension of the copper import tax for another year was voted by Congress late in June. President Eisenhower signed the measure on the last day of the month, extending the period of suspension of the 2c tax until June 30, 1955. As in the past, the law contains safeguards that would automatically restore the duty in the event that the price should drop to 24c or under for a calendar month.

Copper continues in a firm position and market authorities believe that the price can be maintained at the 30c level throughout the third quarter. To project the outlook beyond a three-months' period would be foolhardy, the experts claim. Repeated threats of strikes in Chile and elsewhere make it almost impossible to obtain a clear picture of the world's available supply. In regard to consumption, political factors, coupled with defense demands and stockpiling, distort all estimates on probable needs of industry. The most encouraging development in copper has been the continued expansion in use outside of the United States. The recovery in Europe continues and there are strong indications that countries behind the Iron Curtain are obtaining fair tonnages of copper in one form or another despite restrictions still in force to curb such activity.

Copper Institute's figures for May revealed that stocks in the hands of producers declined by 42,412 tons in the U. S. and by 17,836 tons outside of this country. The combined reduction in stocks of refined copper of 60,248 tons was caused in large measure by deliveries of Chilean surplus metal to the U. S. Government for its stockpile under the deal announced in the preceding month. Deliveries of copper during May to U. S. fabricators increased to 111,005 tons, which was well above the low of the year to date (see page 108). U. S. mine output (crude) during May was at the daily rate of 2,305 tons, which compares with 2,366 tons in April and 2,481 tons in January.

Lead was purchased for the stockpile, but not until the industry became thoroughly confused over the intentions of the Government as to price at which purchases would be made and quantities involved. The General Services Administration asked for offers of both lead and zinc to be made by noon June 10. Offers were restricted to metal produced from ores of domestic origin mined subsequent to April 1, 1954, and "must be so certified." In the initial request it was stated that deliveries must be completed prior to Aug. 2, 1954. What was not known in industry circles was that certain limitations were imposed on GSA as to price. It developed that lead purchases were to be made at prices "up to 14c." On the date that offers of lead were made to GSA the market price of lead was 14¼c, N. Y. The offers were turned down. Then lead was offered for the stockpile at 14c, which also resulted in no sale. On June 15, the market price was reduced to 14c, N. Y., and 13.80c, St. Louis. This cancelled out a rise of one-quarter cent announced June 2.

Late on June 16, Arthur S. Flemming, director of the Office of Defense Mobilization, to clear up the mess, authorized the GSA to purchase lead for the stockpile at the market price. This resulted in the acceptance of between 6,000 and 8,000 tons of lead for the strategic reserve. The purchases were made at the market price of 14c.

Zinc, more of a problem child than lead because of the 200,000 tons now in the hands of smelters, was purchased by GSA to the extent of 12,000 tons or more, all on the basis of 11c, East St. Louis. Most of the metal purchased for the strategic reserve consisted of Regular High Grade. In the case of zinc, it appears that GSA could have purchased the metal at a price "up to 13c." As June ended, both lead and zinc producers were awaiting word from Washington on what the Government really has in mind in reference to its long-term mineral stockpile objectives. Such a statement was promised for sometime after July 1.

Final acceptance of the International Tin Agreement has been established by the signatures fixed to the plan during the closing days of June. All of the major producing areas have subscribed to the control scheme and the required number of votes have been obtained from consuming areas, even though the U. S. officially took no active part in the proceedings. Optimism over the success of the deal caused the price to advance by almost 3c per pound during June. The U. S. Government will continue to operate the Texas City tin smelter for a year and the output of this plant will continue to move into the stockpile. It follows that the U. S. will be a buyer of tin concentrates in Bolivia and other areas.

Quicksilver advanced to $280 per flask on wholesale lots, a new all-time high. With the Government absorbing large quantities from mines in Spain and Italy, consumers had a tough time meeting their requirements. There was some hope

Average Prices for June (E&MJ Quotations)

Copper:	
Electrolytic, domestic, refinery	29.700
Electrolytic, export, refinery	29.603
Lead:	
Common, New York	14.106
Common, St. Louis	13.906
Silver and sterling exchange:	
Silver, New York, per oz.	85.250
Silver, London, pence per oz.	72.940
Sterling Exchange, "Checks"	281.824
Zinc:	
Prime Western, East St. Louis	10.960
Prime Western, delivered (g)	11.460
Tin:	
New York Straits	94.192
New York, 99% min. (e)	93.192
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$275.000
Antimony (E&MJ) (d)	31.970
Antimony, bulk, Laredo	28.500
Antimony, in cases, Laredo	29.000
Platinum, refined, per oz.	$84.000
Cadmium (a)	170.000
Cadmium (b)	171.635
Cadmium (c)	173.269
Aluminum, 99% plus, ingot	21.500
Magnesium, ingot	27.000
Nickel (f)	60.000

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.
(a) Cadmium average based on the producers' quotations.
(b) Cadmium average based on the average of the producers' and platers' quotation.
(c) Cadmium average based on platers' quotation.
(d) Domestic, 5 tons or more but less than carload lot, packed in cases, f.o.b. New York.
(e) Tin content.
(f) F.o.b. Port Colborne, U.S. duty included.
(g) Delivered where freight exceeds 0.5c.

Markets Continued on Page 108

that the Government would change its policy and make more metal available to the trade.

Manganese and chrome ores remained inactive, with buyers apparently holding off from making new commitments pending an upturn in steel production. Prices were largely nominal. Tungsten ore outside of the U. S. was unsettled on lessened tension in the Far East. Domestic output is going to the Government for its stockpile on the basis of $63 per short ton unit. Wolfram of foreign origin sold down to $22 per short ton unit, c.i.f. U. S. ports, duty for the account of the buyer.

"Free" Gold Market

GOLD TRANSACTIONS during June declined 8%, compared with May. The turnover on the London market lost about 60% in volume. Leading in sales in Paris were the offerings of Russian gold estimated at 20 to 25 tons. Excepting Bombay, price movements were unimportant. Pick's Currency Report quotes as follows, per fine oz:

	COINS		BARS (12.5 kg.)	
	May 28	June 30	May 28	June 30
NEW YORK, transit	.....	.....	$35.10	$35.10
MANILA	$41.00	$41.50	38.60	38.50
HONG KONG	41.25	41.50	37.75	37.50
BOMBAY	52.50	49.10	51.50	47.50
TANGIER	40.50	41.50	35.05	35.05
BEYROUTH	41.00	41.75	35.25	35.25
PARIS	41.50	41.50	35.60	35.85
BUENOS AIRES	42.00	41.50	39.50	39.00

Note. All prices are computed at the free or black market value of the U. S. dollar in the local markets.

Major Metals

U. S. DAILY AND AVERAGE PRICES

June 1954	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc Delivered (f)	Zinc East St. Louis
1	29.700	29.675	93.750	14.000	13.800	11.000	10.500
2	29.700	29.625	94.500	14.250	14.050	11.000	10.500
3	29.700	29.675	93.750	14.250	14.050	11.450	10.950
4	29.700	29.625	93.750	14.250	14.050	11.500	11.000
5	No Market	29.625	93.750	14.250	14.050	11.500	11.000
7	29.700	29.700	93.500	14.250	14.050	11.500	11.000
8	29.700	29.550	93.750	14.250	14.050	11.500	11.000
9	29.700	29.700	93.750	14.250	14.050	11.500	11.000
10	29.700	29.600	94.250	14.250	14.050	11.500	11.000
11	29.700	29.525	93.750	14.250	14.050	11.500	11.000
12	No Market	29.650	93.750	14.250	14.050	11.500	11.000
14	29.700	29.600	93.500	14.250	14.050	11.500	11.000
15	29.700	29.650	93.375	14.000	13.800	11.500	11.000
16	29.700	29.550	93.500	14.000	13.800	11.500	11.000
17	29.700	29.575	93.625	14.000	13.800	11.500	11.000
18	29.700	29.575	93.375	14.000	13.800	11.500	11.000
19	No Market	29.550	93.375	14.000	13.800	11.500	11.000
21	29.700	29.500	93.375	14.000	13.800	11.500	11.000
22	29.700	29.500	94.125	14.000	13.800	11.500	11.000
23	29.700	29.625	94.750	14.000	13.800	11.500	11.000
24	29.700	29.600	94.750	14.000	13.800	11.500	11.000
25	29.700	29.600	95.000	14.000	13.800	11.500	11.000
26	No Market	29.600	95.000	14.000	13.800	11.500	11.000
28	29.700	29.600	95.875	14.000	13.800	11.500	11.000
29	29.700	29.600	96.500	14.000	13.800	11.500	11.000
30	29.700	29.600	96.625	14.000	13.800	11.500	11.000
AVERAGES FOR MONTH							
June	29.700	29.603	94.192	14.106	13.906	11.460	10.960
AVERAGES FOR WEEK							
June							
2	29.700	29.638	94.150	14.050	13.850	11.000	10.500
9	29.700	29.646	93.708	14.250	14.050	11.492	10.992
16	29.700	29.596	93.688	14.167	13.967	11.500	11.000
23	29.700	29.554	93.771	14.000	13.800	11.500	11.000
30	29.700	29.571	95.625	14.000	13.800	11.500	11.000
CALENDAR WEEK AVERAGES							
June							
5	29.700	29.638	93.900	14.200	14.000	11.290	10.790
12	29.700	29.621	93.792	14.250	14.050	11.500	11.000
19	29.700	29.583	93.458	14.042	13.842	11.500	11.000
26	29.700	29.600	94.500	14.000	13.800	11.500	11.000

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

June 1954	Sterling Exchange "Checks"	Silver (c) New York	Silver London	Gold London	Gold (d) United States
1	281.8125	85.250	72.750d.	248s. 10½d.	$35.00
2	281.8125	85.250	72.750d.	248s. 10½d.	35.00
3	281.8125	85.250	72.750d.	248s. 10½d.	35.00
4	281.8125	85.250	72.750d.	248s. 10d.	35.00
5	(e)	(e)	(e)	(e)	35.00
7	281.8125	85.250	Holiday	Holiday	35.00
8	281.8125	85.250	72.750d.	248s. 10d.	35.00
9	281.7500	85.250	72.750d.	248s. 11d.	35.00
10	281.7500	85.250	72.750d.	249s. 0d.	35.00
11	281.7500	85.250	72.750d.	248s. 11d.	35.00
12	(e)	(e)	(e)	(e)	35.00
14	281.8125	85.250	72.875d.	248s. 11½d.	35.00
15	281.8750	85.250	73.000d.	248s. 11½d.	35.00
16	281.8125	85.250	73.000d.	248s. 11d.	35.00
17	281.8750	85.250	73.000d.	248s. 11d.	35.00
18	281.8125	85.250	73.000d.	248s. 10½d.	35.00
19	(e)	(e)	(e)	(e)	35.00
21	281.8125	85.250	73.000d.	248s. 10d.	35.00
22	281.8125	85.250	73.125d.	248s. 9½d.	35.00
23	281.8125	85.250	73.125d.	248s. 9½d.	35.00
24	281.8750	85.250	73.125d.	248s. 9½d.	35.00
25	281.8750	85.250	73.125d.	248s. 10d.	35.00
26	(e)	(e)	(e)	(e)	35.00
28	281.8750	85.250	73.125d.	248s. 10½d.	35.00
29	281.8750	85.250	73.125d.	248s. 11d.	35.00
30	281.8750	85.250	73.125d.	248s. 11d.	35.00
AVERAGES FOR MONTH					
June	281.824	85.250	72.940	—	35.00
AVERAGES FOR WEEK					
June					
2	281.813	85.250	—	—	—
9	281.800	85.250	—	—	—
16	281.800	85.250	—	—	—
23	281.825	85.250	—	—	—
30	281.875	85.250	—	—	—

Calendar Week Averages, New York Silver: June 5th, 85.250; 12th, 85.250; 19th, 85.250; 26th, 85.250.

(e) No market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125c to 0.15c per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East, Middle West, and West, effective Jan. 1, 1951, commanded a premium of 1.35c per pound over the current market for Prime Western; Special High Grade 1.50c.

(f) Prime Western delivered where freight from E. St. Louis exceeds one-half cent.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The Daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fractions of a cent per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, as reported daily by regular suppliers, and is usually one quarter-cent below the price paid for such bar silver, this deduction being the allowance to such suppliers for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5c per troy ounce 1000 fine, effective July 1, 1946. London silver is pence per troy ounce, basis .999 fine.

(d) U.S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Behind the By-Lines . . .

G. P. Lutjen

Before you go any further, there are two hot items in this issue that no man in his right mine can afford to miss.

Item 1, found up ahead on p 35, is a simple new type magnetometer. Fundamental principle of its operation is a wobble, but top geophysical companies are keeping a sharp eye on its development.

Item 2, back on p 99, is a newly patented smelting process that may open up new vistas for the industry. It makes refractory ores as easy to handle as the Pittsburgh Pirates.

Getting in on the ground floor, so to speak, of a big new mine, is the opportunity presented on p 81. Equipped with camera and portable daiquiri tester, we recently safaried to Moa Bay (Cuba) in the cabin of a Beechcraft, owned and flown by one Mario Dia, hot pilot. In the company of Dick Colligan, *charge d'affaires* for Nicaro Nickel Co., in Cuba, and Bal Darnell, supervisor of Moa's exploration work, we were privileged to get the DeLuxe Tour of the property, complete with maps, assays and the peering down of 40-ft test pits.

Being on the spot before the mine has even started, we have beaten history to the punch, so we are giving history its innings by presenting the whole story behind Moa Bay. Not only does this story cast an interesting light on what will one day be one of the world's important nickel producers, but in many ways it is typical of how a big mine comes into being through the efforts of many men stretched over many years. For Moa, this story has never been completely told before and we think you will be surprised at who and how many men were involved.

The never ending detective work goes on in the Great Grinding Mystery. On p 84 of this issue we present more clues for gumshoes working on this baffling case. "How to Select Synchronous Motors for Taconite Grinding Mills" by J. C. Marous and E. F. Merrill of Westinghouse Electric Corp., is an interesting package of facts on starting torque in rod and ball mills. It is one of the best articles we have seen for taking the theory of grinding and turning it into useful, practical help for the operator. In life, they say that it's the first 100 years that count: in your ball mill, its the first 200 degrees of revolution that count, and here's where you'll find out exactly what goes on in those 200 degrees.

We have been accused, and perhaps with some justice, of having been somewhat unchivalrous in our treatment of Yugoslavia in this column in the May issue. Our chief misdemeanors, we gather, were: (a) virtually allying Yugoslavia with the Soviet Union, a status which is neither true nor desirable from either the Yugoslavian point of view or the American; we're glad Yugoslavia's on our side; (b) impugning Yugoslavian hospitality, which according to eye-witness reports, is completely unimpugnable.

We were a little taken aback by this reaction. We wrote that misbegotten paragraph in the naive expectancy that a few readers, Yugoslavian readers in particular might get a smile out of its utter absurdity.

Does anybody have a home remedy for a slight case of chagrin?

Under the heading, "High Noon," *Westward,* published by Kaiser Steel, quotes the following exciting paragraph:

"The word was flashed to officers in three radio cars: 'Code three . . . proceed with red lights and sirens . . . two brothers dueling to the death with double-barreled shotguns. One man already severely wounded'. The cops rushed onto the scene, found Jim Ceballos, 3, with a lacerated lip. His brother Al, 5, had swatted him with a toy shotgun. Their mother was hysterical."

Confidentially, we understand that executives returning to General Motors from Government service are required to sell their Government bonds.

Science fiction has no monopoly on monsters. Take the 60-cu yd shovel that Marion Power Shovel Co. is building for Hanna Coal Co. It will be able to move 100 tons of earth every 50 seconds. From ground to boom point the shovel measures 145 ft, or as high as a 12-story building. Eight crawler treads, mounted in pairs, each are 8 ft high, 22 ft long and 54 in. in tread width. Total weight of the shovel is 5-million lb. The thing is so large, an elevator to ride up to the control section will be built in the hollow, 6-ft dia center pin. Sixteen motors will develop a total of 4500 hp. The release we received didn't mention the basketball court or location of the grand ballroom.

Almost everyone is asked, from time to time, to contribute a shekel or two to the old alma mater and practically any reply but hard cash is unsatisfactory to the fund collectors. The following letter received by one such group is an exception:

"As I am an aluminum of two other colleges besides Yarvard, and cannot, with my bismuth in its present state, pay antimony to all three, I hope you will not think me a cadmium if I do not caesium this opportunity of making a donation. So far this year I have metal current expenses, but in these troubled times when the future holds in store we know not phosphorus, I could not make a contribution without boron from the bank. It would nickel out of my savings. A manganese spend his dollars these days; a tin spot is gone in no time. One is lead to believe he is pouring them down the zinc. Much better to sodium up in a stocking. So don't be silicon not make any contribution this year unless a bromine helps me out."

And so with a word of thanks to *More Power to You,* published by C & D Batteries, Inc., and with your kind permission we'll hit the rhodium.

ENGINEERING AND MINING JOURNAL

JULY 1954

Uncle Sam Does It Again

WHY, WITH SO MANY PAINFUL LESSONS to the contrary, do so many people still insist that the only trouble with government aid to industry is that it has not yet gone far enough.

Take lead and zinc mining, for example. The Government has been "doing something" for lead and zinc mining ever since Pearl Harbor, and look at it! Of course, one might argue that being largely responsible for the damage, Government ought to stay around and help clean it up, but before you decide that point, just consider the facts.

We recall so clearly the time when lead and zinc, according to the Government, were not only critically short, they were "permanently" short. There would never be enough lead and zinc. All-out production and exploration for new sources were demanded of the industry.

Producers, as we all know, did their best to comply. Productive capacity was pushed to the limit! New, and in the case of zinc, huge sources of ore were uncovered.

These processes were encouraged by the Government in every conceivable way, and with the utmost vigor. We are not blaming anyone for it. We're simply stating facts.

The result, of course, was a world-wide panic rush to buy up metal and secure new mines. This, in turn, was followed by a gradual awakening, by a slackening in demand, and by an eventual oversupply of metal.

Everything dropped but the producers' costs. The US lead-zinc industry has been hard hit, to put it mildly.

To help US miners, the Government announced last March that it intended to step up stockpiling of certain materials, including zinc and lead, ostensibly to take care of expanded strategic needs. The move had the appearance, however, of an attempt to aid metal producers without endangering the Administration's foreign trade program by giving miners the tariff protection they had asked for.

Naturally, lead and zinc markets responded to this stimulus, although much disquiet was felt in the industry over the lack of word on when, where, and how much the Government intended to stockpile.

Suddenly, in mid-June and with one day's notice, the Government asked for offers of lead and zinc. Startled, but still game, many producers made snap offers. To their amazement, the Government took very little zinc and no lead whatever, indicating that lead, offered at 14¼c, and later at 14, was too high.

Apparently the original ODM order put a ceiling on lead buying at 14c. This limitation was later removed by Mr. Flemming's statement on June 17 that lead would be bought hereafter "at the market."

The indication is clear, however, that GSA hasn't unlimited funds to spend for stockpiling lead and zinc. Unless further appropriations are made, or funds provided in some other manner, the save-the-industry stockpile program doesn't seem to carry much authority. Perhaps it is just as well.

At any rate, most domestic producers are by now both puzzled and enraged. They have over-produced at Government request; their costs have been vastly inflated; their incomes have been drastically cut. The widely-heralded attempts to help them have so far only compounded the confusion.

It is of little use to blame zinc producers for continued over-production in the face of collapsing markets, because (unlike copper) much of lead and zinc production comes from producers whose only hope of profit lies in keeping per-lb costs down by keeping volume of output high.

It is of little use, either, to blame Government. That is simply the way governments operate, and it doesn't seem to matter much whether Democrats or Republicans call the signals. The confusion over who has the ball and what he will do with it is quite as acute as ever.

We are not, therefore, going to complain, as at one time we might have. We will simply renew an old suggestion, that much of this difficulty could be avoided: 1, if Government would reactivate, and *listen to*, a capable industry advisory committee; 2, if industry would quit expecting that *this* time it will be different, that *this* time the Government will really solve their problems.

Just remember that when the Government *does* solve all your problems, you have, as the saying goes, had it.

NEW 7500-TON COPPER CONCENTRATOR in Pima County, Ariz. went on stream late in April, following extensive test runs. Crushing plant, and special building housing conveyor drives appears in left foreground, and flotation mill in left rear.

Silver Bell: AS&R's New Arizona

JOHN B. HUTTL
Associate Editor

OF THE FIVE MAJOR COPPER ENTERPRISES started in Arizona since the beginning of 1951 to increase the nation's copper supply, the first to reach the production stage is American Smelting & Refining Co.'s Silver Bell property in Pima County. Late in April the new 7500-ton concentrator went on stream following comprehensive test runs. The completed project, consisting of two open pits, concentrator, modern housing facilities, and water supply system, took a little over two years to complete and represents an investment of about $17-million.

Ore reserves developed to date assure a property life of more than 12 years, at a scheduled annual production rate of 18,000 tons of copper contained in concentrates to be shipped to the company's El Paso smelter. As per agreement, the Government will buy 88,500 tons of the first 98,500 tons of copper produced at a price of 24½c per lb, in the event copper could not be sold for more in the open market. This floor price is subject to adjustment in accordance with changes in certain operating costs as

OXIDE PIT OF THE SILVER BELL PROPERTY measures roughly 2100x1500 ft. Materials removed to April 1, 1954 totaled 11.8-million tons of waste; 1.7-million tons of leach material; and 350,000 tons of ore running less than 1% copper.

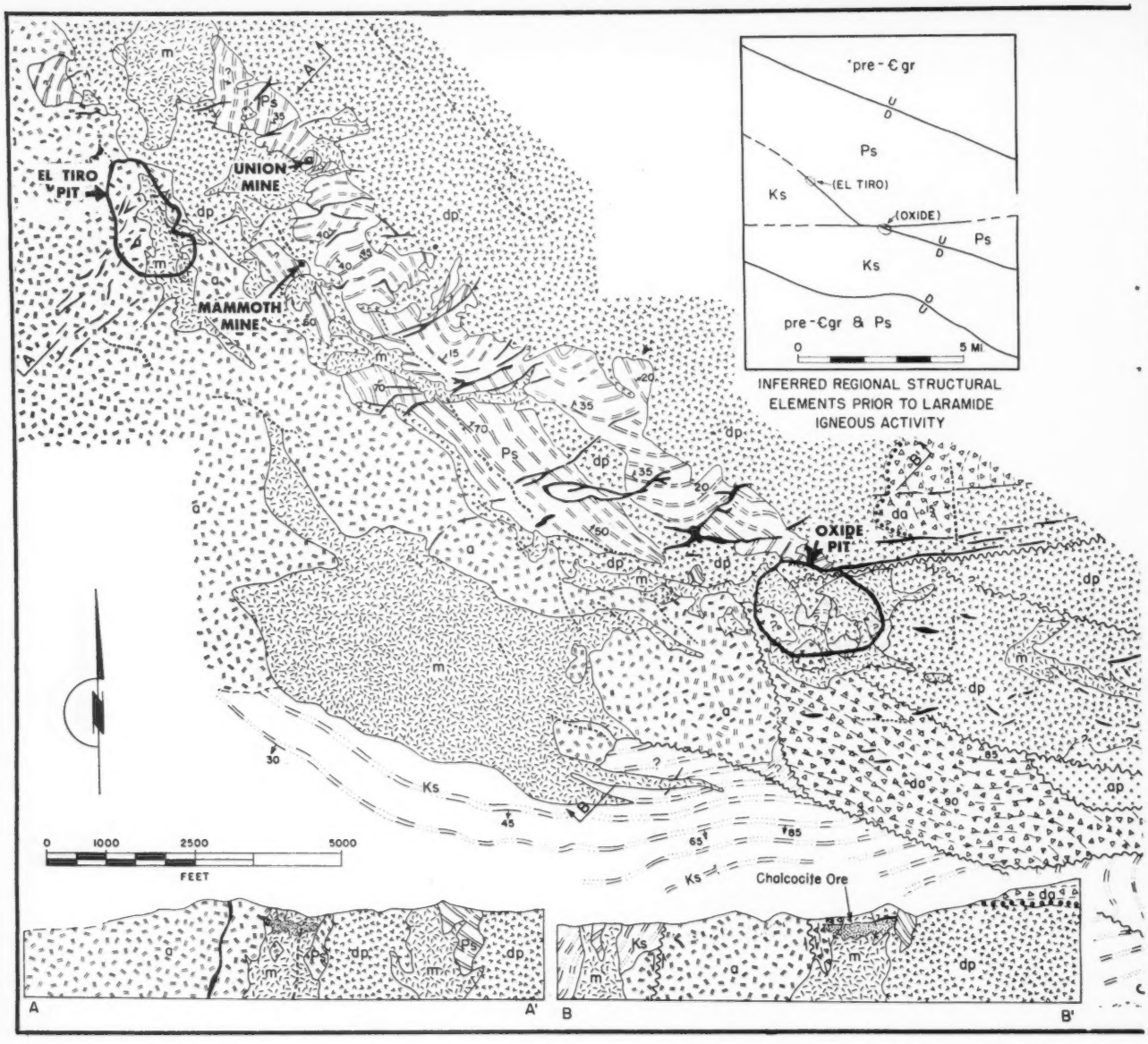
Copper Project Starts Production

indicated by the Bureau of Labor Statistics. Government commitments end 5½ years after commencement of operation of the mill.

First Mining Done in 1865

Mining in the area dates back to 1865 when the Mammoth mine of the Silver Bell Mining Co., also known as the Boot mine, was opened. Oxide copper ores containing minor silver-lead values mined from replacement deposits in garnetized limestone were treated in local smelters. Despite the intermittent operations carried out by various companies, including the Imperial, El Tiro, and others, and independent leasers, copper production passed the 45-million lb mark in 1909.

During 1909 the disseminated copper possibilities in igneous rocks were recognized and a three-year campaign of churn-drill exploration followed, leading to the partial delineation of two copper sulphide deposits known today as the Oxide and El Tiro. Low copper content of the ore discouraged exploitation of the deposits at that time, but selective mining of orebodies in the sedimentary rocks continued intermittently until 1930, providing a production total for the district of



about 100-million lb of copper. American Smelting entered the district in 1915 when it purchased the holdings of the Imperial Copper Co. In 1940, the company consolidated the holding of various companies into one group comprising about 150 patented claims, followed in 1948 by exploratory and check drilling of the disseminated deposits mentioned. As a result, plans were made to mine and mill the Oxide and El Tiro orebodies at a rate of 7500 tons a day.

(Geology of the area and the orebodies is described and illustrated above.)

Development Started In 1951

Development of the two pits, the Oxide and El Tiro, was started in December 1951. Since then and up to April 1, 1954 there have been removed from the Oxide pit some 11,800,000 tons of waste, 1,700,000 tons leach material, and 350,000 tons of ore assaying less than 1% copper. From the El Tiro pit 2 mi distant more than 2,300,000 tons of waste have been stripped during the same period. All stripping and mining is done under contract by the Isbell Construction Co., of Reno, Nev. All ore currently treated at the concentrator is mined from the Oxide pit. Work at the El Tiro pit currently consists of road building and a small amount of stripping.

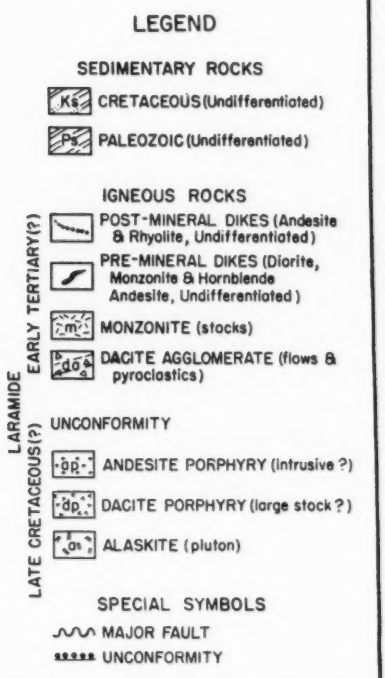
The Oxide is oval shaped, measuring roughly 2100 ft by 1500 ft. Entry is by spiral roadway. Six 40-ft benches have been established so far, the top bench being known as the 2908, and the lowest as the 2780. The present pit floor will ultimately go 160 ft below the 2780 horizon.

Who's Who at Silver Bell

- **T. A. Snedden,** manager, southwest division, AS&R
- **D. R. Purvis,** superintendent
- **H. R. Hendricks,** mill superintendent
- **Russell Salter,** assistant mill superintendent
- **R. B. Meen,** mine superintendent and chief engineer
- **F. B. Kendall,** master mechanic
- **John Ward, Jr.,** operations director, Isbell Construction Co.

Geologic Map of Silver Bell District Arizona

AS&R'S El Tiro Pit and Oxide Pit lie in a northwesterly trending hydrothermal zone about 7 miles long. Regional faults shown in inset were controlling structures for successive periods of Laramide mineralization.



How the Silver Bell Deposits Were Formed

THE GEOLOGY OF THE SILVER BELL DISTRICT has been under study by many geologists, both in Government service and in private practice. In their recent paper "Structure and Mineralization, Silver Bell, Arizona," Kenyon Richard and J. H. Courtright state that the two porphyry type deposits, the Oxide and El Tiro, spaced 2 mi apart, occur within a northwesterly trending zone of hydrothermal alteration some 7 mi in length. This zone lies along a major regional fault which is believed to have formed initially in Paleozoic and Cretaceous sedimentary rocks, and subsequently to have been the locus of repeated Laramide igneous activity. Alaskite followed by dacite porphyry were intruded first. Then, after an erosional interval marked by basal conglomerate, a thick series of dacite flows and pyroclastics was deposited.

Instrusions of small stocks of monzonite and related dikes were preceded and partly controlled by regenerative movement along the main zone and development of cross-breaking fractures. Renewed development of cross-breaking joint systems along the main zone provided the principal control of ensuing hypogene mineralization. Post-mineral andesite dikes were emplaced parallel to the main zone. Lastly, enrichment by supergene chalcocite formed the two orebodies. Details are shown in the accompanying plate.

The two porphyry orebodies developed for exploitation consist of rudely tabular accumulations of chalcocite from 100 to 200 ft in thickness. Lying beneath about 100 ft of leached capping, they were formed by two- to threefold enrichment of copper contained in the primary mineralization. Most of the capping over the orebodies contains less than 0.1% copper as cuprite, or other oxides, mingled with limonite. Occasionally, higher values are present, particularly around the fringes of the deposits where copper as silicates and carbonates has been precipitated by reactive gangue material present in less altered rock. Within the orebodies, where alteration is strong, the upper limit of the sulphide zone usually is highly irregular. Yet, it is a sharp plane. There is no transition zone of mixed oxide and sulphide minerals, except locally in fringe ore areas where alteration is relatively week and rocks are reactive. In general shape the base of oxidation conforms to modern topography, even though local relief exceeds 200 ft. The water table for the most part now is well below the chalcocite zone.

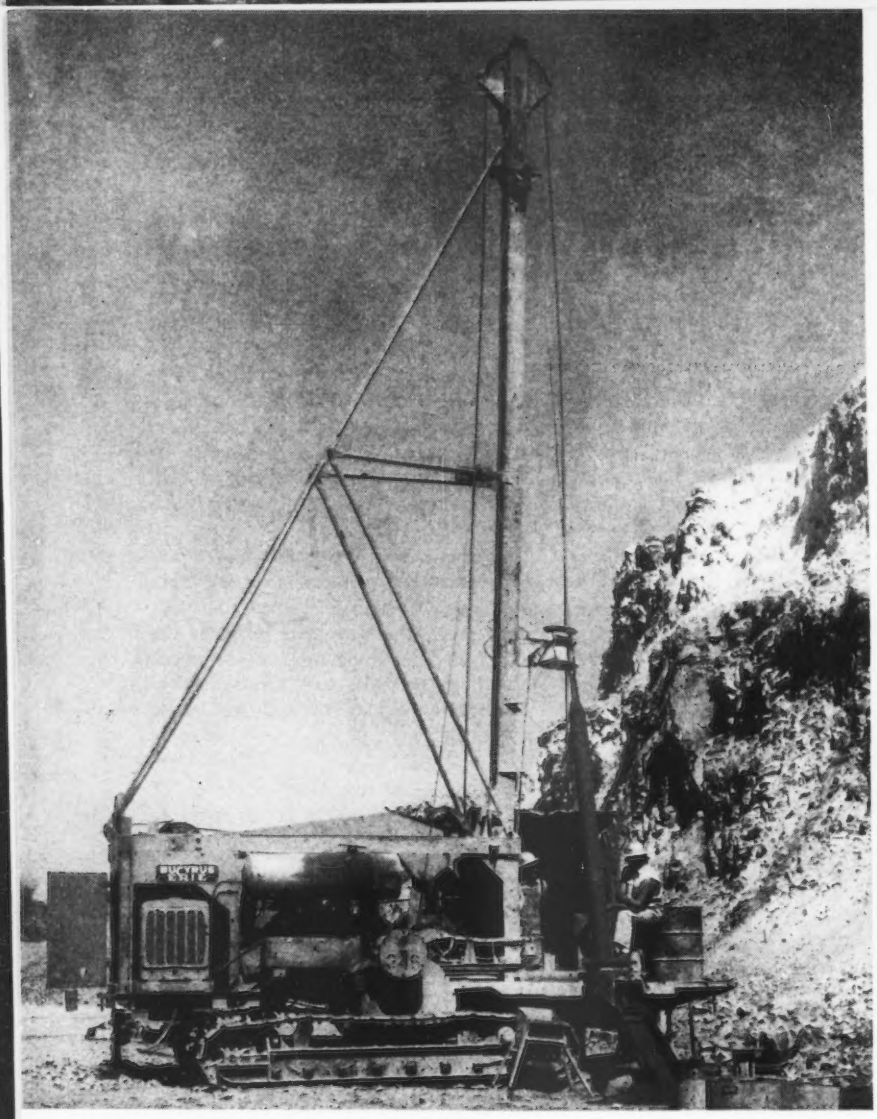
The major fault traversing the pit in about the center in a northeasterly direction is very noticeable. Of the two types of porphyry occurring in the pit the dacite is hard and the monzonite fairly soft, influencing drilling speeds and techniques to some extent. Blastholes are drilled with Bucyrus-Erie 27 and 29 churn drills, all using 9-in. bits. The single row of holes normally used is drilled 16 ft back of the crest of the bench at 21-ft spacing to a depth of 47 ft, resulting in a break of 40 ft after the blast. In two-row blasting, the second row of holes is drilled 24 ft back of the first row, and the break after blasting is 30 ft. Blasting is done with a 45- or 70% Apache bag powder and Primacord. Each hole contains about 25 ft of stemming. Powder factor ranges from 3 to 5 t/lb.

Broken ore and waste are loaded into Euclid FF and T trucks (37-ton and 22-ton capacity) by a Bucyrus-Erie 120-B 5½-yd electric shovel and a Bucyrus-Erie 54-B 3½-yd diesel shovel. Haulage distances to the concentrator average 0.4 mi, and waste haulage about 0.8 mi. Current ore-waste ratio is 1:1. Auxiliary equipment used in the pit includes Caterpillar D-8 tractors; DW-10 tractors equipped with rubber tires and dozer blades for clean-up work; service trucks; sprinkler trucks, and others. Constant road maintenance has cut equipment repair costs to a minimum. Equipment units are serviced and repaired in modern shops maintained by the contractor near the concentrator site. North of the pit a long dike has been built from waste hauled from the upper benches to divert water from near-by drainage areas during heavy rains. Communication between pit and offices of contractor and company is maintained by a radio-phone short wave FM system.

Concentrator of Modern Design

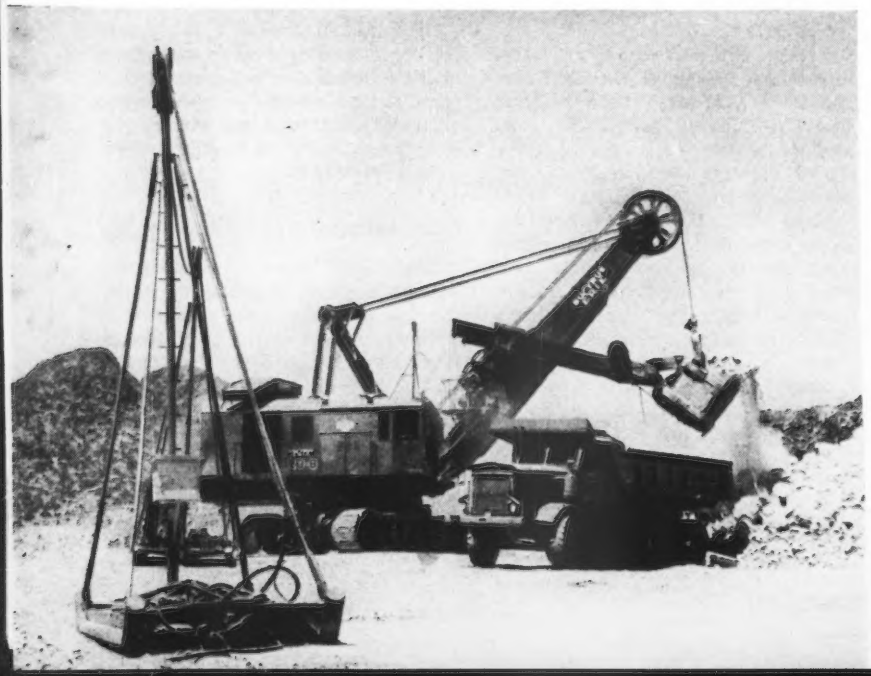
Silver Bell's modern concentrator was designed for economical upkeep and low operating costs. It was built by Stearns-Roger Mfg. Co. of Denver. Much of the design work was done in the Salt Lake City offices of American Smelting and Refining Co. under the direction of Norman Weiss, and by F. C. Torkelson of Salt Lake City. Construction started in June 1952.

All plant buildings are steel-frame structures covered with corrugated



DIESEL-POWERED CHURN DRILLS put down 9-in. holes to a 47-ft. depth to establish 40-ft. benches. Single-row blast-holes are spaced 21 ft.

5½-YD ELECTRIC POWER SHOVEL loads ore into 37-ton truck for 0.4-mi. haul to concentrator. Note skid-mounted poles for power cables.



iron sheeting. Alsynite sheeting is used in place of conventional windows. Outstanding design features include: Housing all crusher units in one building and all belt drives in another; a pressurized switch gear tunnel, and generous use of the latest control and safety equipment in all plant units. Feeders, crushers, vibrating screens, and belts serving them are interlocked both automatic and manual. Belt No. 1 is also interlocked with misalignment switches and magnetic detector which stop the pan feeder but not the primary crusher. The coarse-ore storage bin is safeguarded by a capacity indicator, and all crushers are interlocked on their oiling systems to sound alarms. If oil pressure falls or oil temperatures rise, the alarm will sound first, and the unit shut down after a 3-min interval. At the truck dump station above the primary crusher a "Dump" and "No Dump" signal system is installed to regulate and safeguard dumping operations. Primary ball mills are equipped with hydraulic starting jacks. Heavy-duty belt feeders used throughout the plant under storage and surge bins have variable-speed drives controlled from the central operating panel in the crusher building. The Inter-Com system permits communication with operators at the top of the fine-ore bins at the head of the concentrator building.

Cranes Speed Repairs

To speed repairs and handle materials with minimum labor, all plant buildings contain crane installations. All are of Shaw-Box manufacture. In the concentrator building, a 15-ton crane with 5-ton auxiliary unit spans the grinding floor, while two 5-ton units serve the flotation bays. The crusher building contains a 50-ton crane with a 15-ton auxiliary unit, and the transfer house a small hand-operated crane. A 10-ton crane is available in the machine shop near the concentrator.

Practically no mechanical troubles were experienced when the concentrator was started up in April. Operations at the time of visit were still conducted on a "tune up" and test basis, but preliminary results indicate that the concentrator will perform tonnage-wise and on metallurgy as expected. What happens to the mine-run ore after it is dumped by the trucks into the hopper serving the primary crusher is shown in the accompanying flowsheet.

Crushing to ¼-in. ball mill feed is accomplished in three stages. For this purpose there are available at the crushing plant a 48-in. gyratory

3½-YD DIESEL-POWERED 54-B BUCYRUS-ERIE SHOVELS are used in other parts of the Silver Bell Oxide pit for loading. Both 22-ton and 37-ton rear-dump Euclid trucks models T and FF, respectively, handle pit haulage.

crusher, set 6 in., a 7-ft standard secondary cone crusher, set 1¼-in., and two 7-ft tertiary cone crushers with vibrating screens fitted with screens containing ½-in. square openings ahead of them. Two large Roto-Clone units represent the dust collecting system at the crushing plant.

Ore Is Ground to —200 Mesh

Grinding to about 65% minus 200 mesh is done in four 10½x12-ft ball mills using 3- and 2-in. balls operating in closed circuit with 85-in. Akins screw classifiers. The pulp overflowing from the classifiers at 24% solids goes to a central distributor serving four units of rough flotation machines, each made up of two 4-cell and two 8-cell machines in series.

Rougher tailings flow direct to a 275-ft dewatering thickener, with the overflow going to a 1-million-gal reservoir, and the underflow via a Transite pipe line system to the tailings ponds. The rougher concentrates are pumped to a 26-ft Hydroseparator. Underflow from this unit is the feed for the regrind section consisting of two 7x12-ft ball mills operating in closed circuit with four DorrClones, and the overflow according to need can either be sent direct to the two 6-cell cleaner machines handling the DorrClone overflows or to two 100-ft middling thickeners.

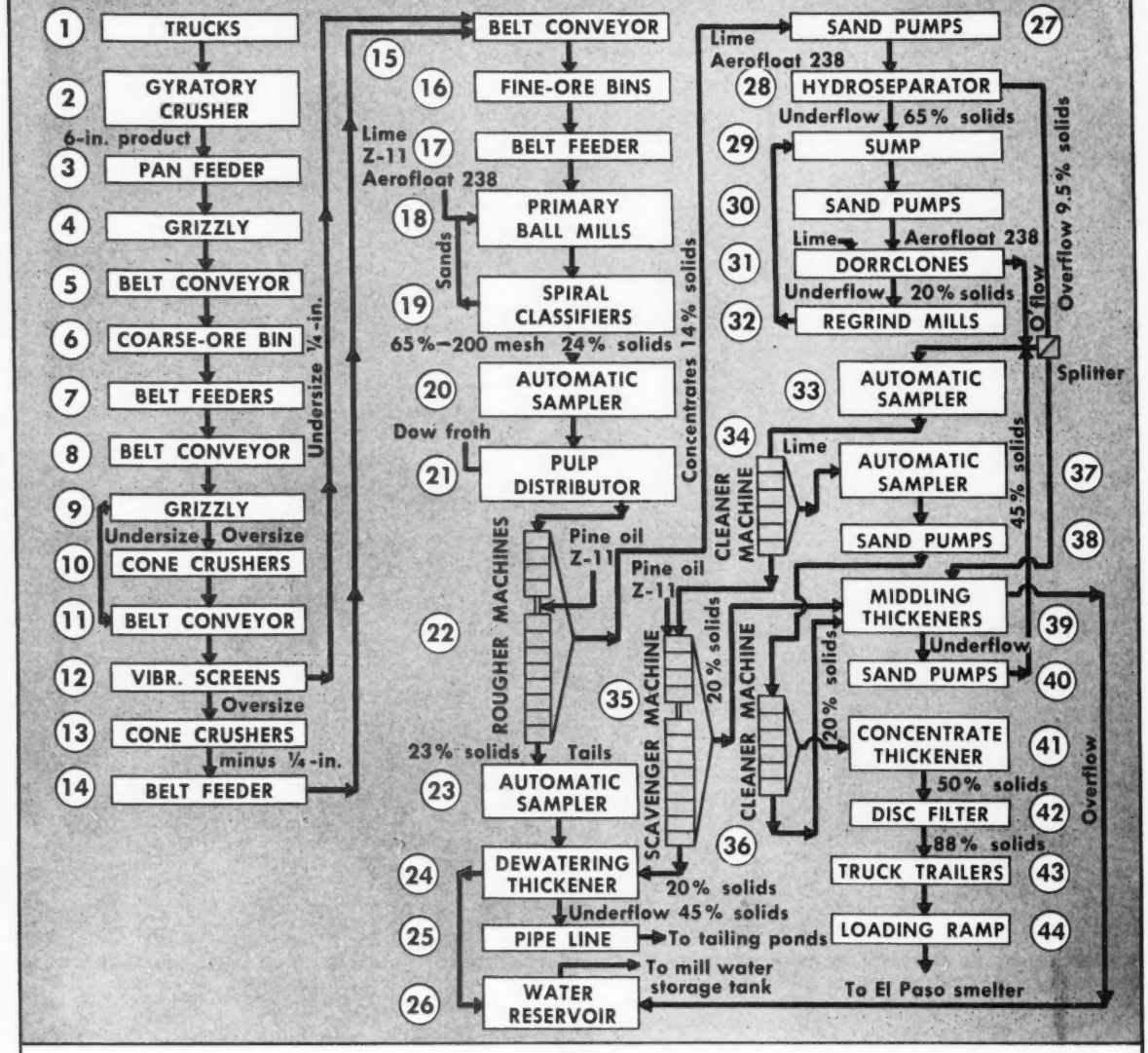
Scavenger Treats Tailings

Concentrates produced by the cleaner machines are recleaned in a 6-cell machine, with the final concentrates receiving successive treatment in a 60-ft thickener and 6-ft disc filter installed at the shipping plant. Tailings from the final cleaner machine go to the middlings thickeners, as do the concentrates produced by the scavenger flotation unit handling the tailings from the two cleaner machines. The scavenger unit consists of a 4-cell and an 8-cell flotation machine in series. Underflow from the middlings thickeners is pumped back to the two cleaner machines and the overflow goes to the reservoir mentioned previously. Final tailings are trucked to the loading point connected to the Southern Pacific main line some 23 mi distant for shipment to the El Paso smelter in 20-ton Freuhauf trailers attached to Kenworth diesel trucks.

Reagent Consumption

Reagents used in the mill circuit include lime, Z-11, Aerofloat 238, pine oil, and Dow froth. Points of addition are indicated in the flowsheet. Consumption per ton of ore treated so far have averaged lime, 8 lb/t; Aerofloat, 0.06 lb/t; Z-11, 0.06 lb/t; and pine oil, 0.02 lb/t. Experiments are conducted with Dow froth. Ratio

FLOWSHEET OF 7,500-TON SILVER BELL CONCENTRATOR



LEGEND

1. Euclid FF trucks (37-ton cap.) from pits
2. Traylor 48-in. gyratory crusher, set 6 in.
3. S-A 72-in. pan feeder
4. Chute with built-in grizzly
5. 48-in. belt conveyor with magnetic detector
6. 3000-ton circular steel coarse-ore bin
7. Two 48-in. belt feeders
8. 42-in. belt conveyor with suspended magnet
9. Chute with built-in grizzly
10. 7-ft Symons secondary cone crusher set 1¼ in.
11. 36-in. belt conveyor
12. Four 6x10ft Tyrock vibrating screens (½-in. square openings)
13. Two 7-ft Symons tertiary cone crushers, set ¼ in.
14. Two 36-in. belt feeders
15. 36-in. belt conveyor with Weightometer
16. Four 2000-ton fine ore bins, circular, steel construction
17. Four belt feeders and Weightometers
18. Four A-C 10½x12-ft primary ball mills driven by 900-hp motors at 18.4 rpm, 3- and 2-in. balls used.
19. Four 85-in. Akins screw classifiers.
20. Automatic sampler
21. Pulp distributor
22. Eight Wemco Fagergren rougher units made up of 4-cell and 8-cell machines in series (two units to each mill circuit)
23. Automatic sampler
24. Dorr 275-ft dewatering thickener
25. Transite pipe line system to tailings ponds
26. 1-million-gal water reservoir
27. Six Hydroseal sand pumps (two standby)
28. Dorr 30-ft Hydroseparator
29. Sump
30. Four Hydroseal sand pumps
31. Four DorrClones
32. Two 7x12-ft A-C regrind mills
33. Automatic sampler
34. Two Wemco Fagergren 6-cell cleaner machines
35. Scavenger machine made up of 4-cell and 8-cell in series Wemco Fagergren units
36. Denver 6-cell cleaner machine
37. Automatic Sampler
38. Three Hydroseal sand pumps (one standby)
39. Two 100-ft Dorr middlings thickeners
40. Three Hydroseal sand pumps (one standby)
41. Dorr 60-ft final concentrate thickener
42. Oliver 6-ft disc filter
43. 20-ton Kenworth-Fruehauf truck-trailer units
44. Loading ramp at railroad

of concentration is about 50:1, and overall recovery is nearing the 80% mark. Concentrates shipped to the smelter at the El Paso property contain 26% copper.

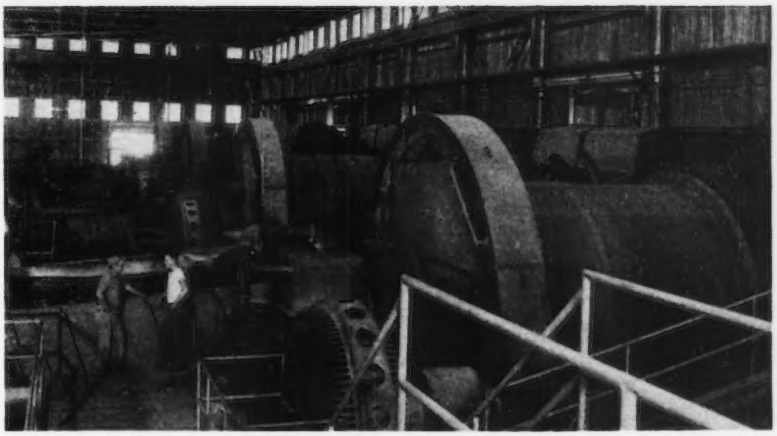
The tailings disposal system operating between the large dewatering thickener at the foot of the concentrator building and the tailings ponds consists of two 16-in. Transite pipe lines set at an 0.8% grade and with concrete drop boxes 8 ft high placed at strategic points. The main line, 8100 ft long, leads to a large disposal area behind an earth-fill dam 45 ft high, and the auxiliary line some 1000 ft long terminates behind a smaller earth-fill dam 25 ft high. At the dam sites the pipes are fitted with special valves and rubber distributor pipes. Reclaimed water is pumped back to the large reservoir at the concentrator.

Water Pumped 9 Miles

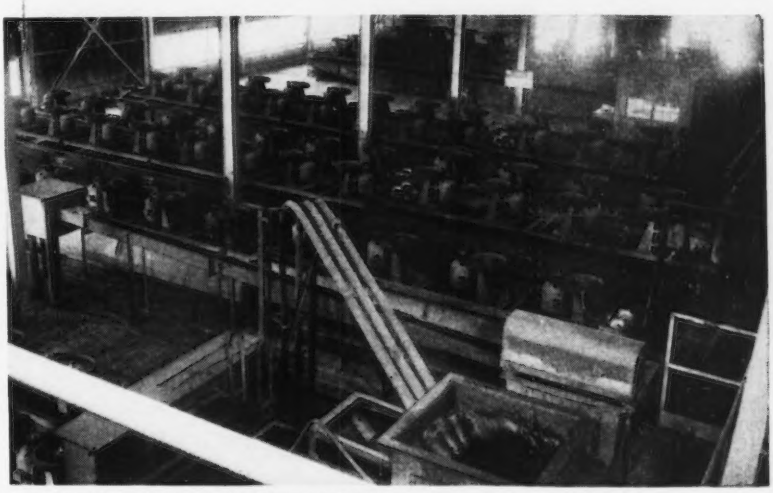
Water for the camp and plant use is obtained from three wells 200 ft deep sunk in the valley about 9 mi southeast of the concentrator. These are equipped with large deep-well pumps discharging into a receiving tank. From here two 2250-gpm centrifugal pumps (one installed in line as booster) deliver it to the mill water storage tank via an 18-in. pipe line. Static head pumped against is 800 ft. All pumps are radio controlled from a station in the concentrator building.

Grouped around the concentrator are the general office, warehouse, laboratory, repair shops, reagent storage and mixing plant, and the repair shops, office, and warehouse of Isbell Construction Co. Electric power furnished by the Tucson Gas Electric Light & Power Co. is brought to the property via a 44,000v power line. Transformers at the pit step the voltage down to 2300v for shovel operation, and at the concentrator the large motors operate on 4160v. Additional transformers supply 440v power for smaller motors and 110v for the lighting systems and camp.

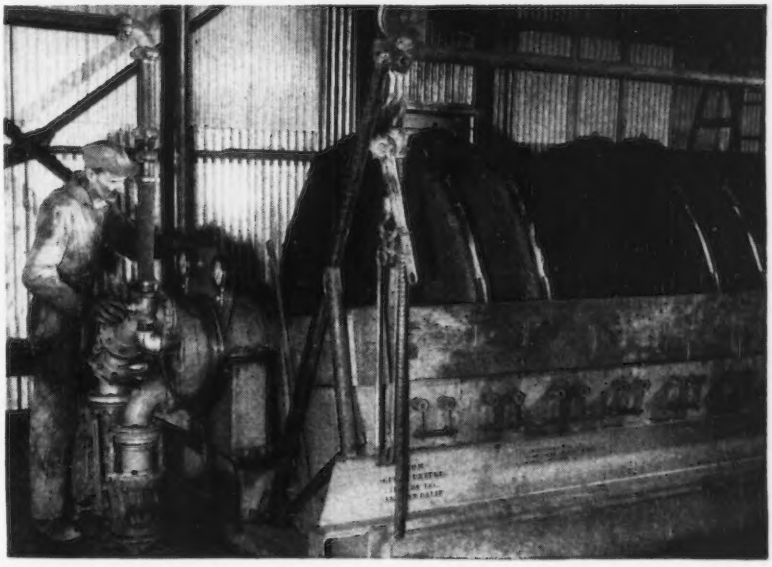
At the townsite there are available 65 modern two-bedroom houses and 35 three-bedroom units, two bunkhouses to accommodate 80 single men, mess hall, 8 apartment buildings. Utah Construction Co. erected these buildings and Mobile Home System furnished the prefabricated houses, mess hall, and store under a sub-contract. Isbell Construction Co. maintains two trailer courts with 90 units near the townsite for its employees. The company employs 140 men, and Isbell Construction Co. has 80 men on the payroll.



¼-IN. CRUSHED ORE IS REDUCED to 65% minus-200 mesh flotation feed in these four 10½x12-ft Allis-Chalmers primary ball mills charged with 2- and 3-in. balls.



EACH OF FOUR ROUGHER UNITS (middle and background) consists of two 4-cell, and two 8-cell machines. Rougher tails go to sampler, and dewatering thickener, and then to pond.



CONCENTRATES FROM 6-CELL recleaners go to 60-ft thickeners, and then to the 6-ft disc filters shown here. Concentrates are shipped to AS&R's El Paso smelter.

At Moa Bay, 600 mi east of Havana, Nicaro Nickel Co. has blocked out 40-million tons of lateritic ore that averages 1.35% nickel, 0.14% cobalt, 46.5% iron.

Dick Colligan, assistant to Nicaro's president, maps out Moa's development.

Coming—An Important

This is the story behind a mine that may one day be the world's second largest nickel producer.

WITH 40-MILLION TONS OF ORE blocked out, plus some valuable assists from Mother Nature, the Moa Bay project of Nicaro Nickel Co., a Freeport Sulphur Co. subsidiary, will soon be one of the world's important nickel producers. Production goal is 30 million lb of nickel metal and 3 million lb of cobalt metal per year.

To block out this ore at its 8000-acre property in Oriente province, Cuba (see map), Freeport has drilled 1850 holes, mostly by hand and machine auger, for a total of 50,000 ft of drilling. The 40-million tons of dry lateritic iron ore thus blocked out averages 1.35% nickel, 0.14% cobalt, and 46.5% iron.

This ore is mainly found on gently sloping terraces over an area about 3 mi wide and 2 mi deep, running roughly parallel to the coast, from 2 to 4 mi inland. The area is cut by northward flowing streams. To the north, the terraces flatten out to the coastal plain; to the south they rise to the Sierra de Moa, 4000 ft high.

On the sloping terraces, ore is found between the elevations of 200 ft and 1000 ft. For the prospector, this belt is plainly marked by pine growth. Above 1000 ft and below 200 ft in the valleys, a jungle-like growth of hardwood trees is found. Another guide to the thick laterites is the concentration of concretions at the surface.

Maximum thickness of the ore is about 80 ft, but the average is 25 ft. Overburden, in the form of lateritic iron ore, low in nickel and cobalt, averages about 15 ft in thickness.

Geology

Geology of the Moa deposits assumes an important commercial significance because of its role in both mining and extractive metallurgy. Dick Colligan, mining engineer supervising exploration and development at Moa for Freeport, described the geology in an AIME paper:

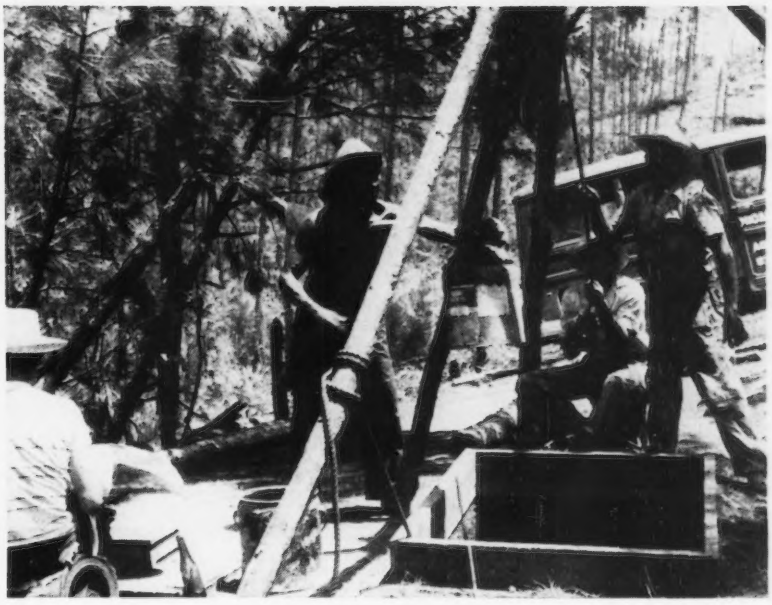
"The Moa district is part of a serpentine massif that forms the chain of mountains along the North coast of Oriente. Serpentinized peridotite is the predominant rock . . . although other basic igneous rocks occur. The general term "serpentine" is used here in describing this group of intrusive rocks. . . . Large embayments of Tertiary sediments, lying unconformable on the serpentine, occur to the east and west, but none is found within the Moa district. . . . It is believed that the thick lateritic mantle was developed on a surface of relatively low relief, which was later uplifted, and has since been severely dissected.

"The lateritic iron ore is developed by weathering in place of the serpentines. A number of examples of chemical analyses are given in the literature, illustrating the progressive change from the unweathered serpentine up through the decomposed serpentine, the yellowish iron ore and the red and brown iron at the surface. . . ."

"Moa deposits differ from Nicaro (See *E&MJ*, June 1954) chiefly in the ratio of lateritic iron ore to decomposed serpentine ore. In making the distinction between 'iron ore' and 'serpentine ore,' an arbitrary cut-off of 35% Fe is used. At Nicaro this ratio is about 1.6 to 1, whereas at Moa the ratio is 10 to 1. Serpentine ore at Moa is non-existent over a great part of the ore areas, and the lateritic ore lies on relatively hard, unweathered serpentine with a zone of transition usually less than a foot thick. Because of the irregular distribution of the decomposed serpentine at Moa, no serpentine ore is included in the reserves."

Naturally plans for mining are in a tentative state, and this report based on preliminary thinking is subject to change. Right now, plans call for hy-

B. F. Darnell, mining engineer, is supervising present exploration work.



Test pits at Moa provide bulk samples. Pine growth marks laterite-bearing ground. Above 200 ft and below 1000 ft elevation, growth is mainly hardwoods.

New Nickel Producer

draulic mining, taking advantage of the hard serpentine base which prevents dilution, and the gentle slope of the ground. Draglines would work from the top, stripping the overburden and then feeding the ore to hydraulic giants which would wash it to sumps. Pumps would move the slurry to a primary beneficiation plant.

The Moa River, where it passes below the mining areas on its way to the sea appears to be an ideal plant location. More than adequate flow the year round would easily supply water for mining and preliminary treatment. The plant would chemically beneficiate the ore prior to shipment to the U.S. of a concentrate for final processing. Planned site is one mile from deep water harbor, another blessing.

Pilot Plant

With exploration out of the way for the time being, work at Moa now consists largely of obtaining bulk samples for pilot plant tests in the U.S.

Freeport, in conjunction with Chemical Construction Co., has been developing an acid leach for Moa ore. Originally, this was investigated when Freeport undertook development of the Nicaro plant for the Government back in 1943. At Nicaro, however, the presence of magnesia in the serpentine ore made acid uneconomic. The absence of serpentine ore at Moa is another of nature's assists.

Testing at Freeport's Hoskins Mound laboratory has already been completed, and a small-scale pilot plant is now being operated on certain process steps. According to a recent Government release, General Services Administration is now negotiating with Freeport regarding a larger, 50-ton-a-day pilot plant to be built and operated by Freeport for the Government, to develop further information about the process. At the same time, a purchase agreement is being discussed for Moa's annual production of 30-million lb of nickel and 3-million lb of cobalt. Although this volume is small in relation to U.S. requirements, the new plant represents one more egg that isn't in the Sudbury basket. It is estimated that when the 1956 goal of 329-million lb of nickel per year available to the U.S. is reached, 80% of the total will come from the Sudbury Basin. Strategically, any steps toward dispersion are to the good.

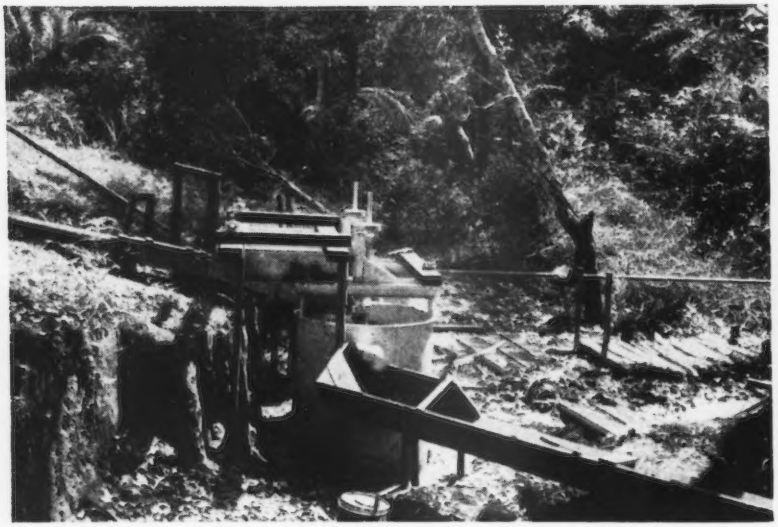
Nicaro Nickel Co. plans to finance the $56-million plant privately and a purchase agreement with GSA would certainly help in raising funds. Construction will commence upon successful completion of the pilot plant program.

We are now, therefore, in the next-to-last chapter of a story that began over a half-century ago. When the mine is in production some years hence, the last chapter will have been written. To see typically what lies behind the making of a mine like Moa before it becomes history, let's take a look at Moa's past.

The Men of Moa

The story of Moa Bay began when General Leonard Wood became military governor of Cuba following the war with Spain. As part of his program for rehabilitation of the war-torn country, Wood ordered a survey of Cuba's natural resources. The island was rumored to have rich mineral deposits and General Wood knew that the opening of mines would lead to roads, and roads to broadened communications and industrial development.

To carry out his plan, Wood requisitioned three government geologists, headed by the chief of the U. S. Geological Survey, C. Willard Hayes, to make a thorough reconnaissance of the island. With Hayes were Arthur G. Spencer and T. Wayland Vaughan. Taking no more equipment than their horses could carry, the three set off into unknown country populated with hostile renegades of the disbanded Spanish Army. As they worked their



Hydraulic mining of Moa ore is possible with hard serpentine underlaying the ore-bodies. Tests at nearby streams showed ore is easy to slurry and pump.

Phil Wilson undertook exploration of Cuban laterites in 1938 for Pardners Mines.

way toward the northeast coast, they crossed a broad valley like the U.S.'s Shenandoah, climbed some low mountains, and on the other side encountered a long gentle slope of curious red soil which lies along the coast from Nicaro to Moa Bay. More than 400 years earlier, Christopher Columbus, on his first voyage to the New World, detected signs of minerals on this very slope—stones the color of iron, others that were believed to contain silver, and still others that glittered but were not gold. Hayes and his colleagues made field analyses and found vast deposits of residual iron ore containing traces of other metals. For the first time, rumors of potential mineral wealth in Cuba were confirmed. "Ours wasn't the first discovery," Spencer recalled recently, "but it was the first time these ores were brought to the attention of the iron trade."

General Wood's survey didn't pay off immediately. Temporarily there was a rush of exploration and claim filing in the hope of uncovering valuable copper, gold, manganese and iron deposits. The mineral wealth was there—a rich storehouse of low quality iron ore which had one serious drawback; it was contaminated with nickel, chrome and cobalt—metals for which there was then little market. In fact, in the case of nickel, the whole world used less in a year than the United States now requires in a little more than a month.

For the next 35 years the story of Moa Bay is one of constant trial and error, of persistence in the face of maddening obstacles and frustrations, of many men and many companies who were convinced that the area's iron could be mined and marketed profitably—but who just could not find an efficient way to get rid of the nickel and cobalt.

Bethlehem Steel tried it in the Mayari area in 1907. Bethlehem built a mine, poured more than a million dollars into the venture, but in the end had to give it up. The contaminating metals required special smelting methods that were simply not justified by the demand for Mayari iron.

Pennsylvania Steel, excited by its geologists' reports that 800-million tons of iron ore lay under the whole area, established a subsidiary, the Spanish-American Iron Co. But in the end Pennsylvania, too, gave up at Moa Bay.

Red Clay Association

Over the succeeding years, literally hundreds of geologists and prospectors trekked through the area, filed "denunciations" (the Cuban equivalent of claim filing), and attempted to interest American capital in backing their ventures. In fact, there were so many of these prospectors, and their experiences were so similar, that they formed a club, the Red Clay Association, the only requirement for membership being the filing of at least one denunciation a day. Among the more prominent members were William Pitt, Sr., C. M. Weld and George Wright.

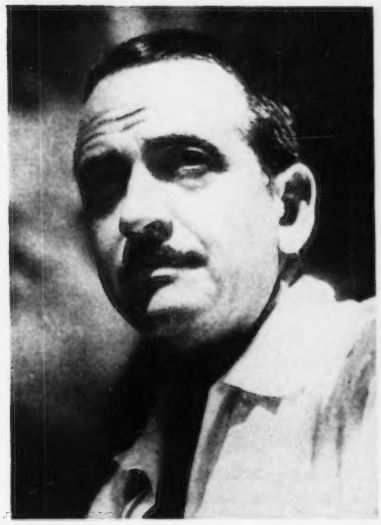
In 1912, three members of this club, convinced that they could lick the problem of iron contamination, formed the Guantanamo Iron Exploration Co., backed by substantial U. S. capital. For the next twenty-five years they attacked this problem with a noteworthy singleness of purpose, seeking a technique to wash out the nickel and cobalt by a leaching process.

One process was developed. It worked well—in the laboratory—but failed in the pilot plant. Experimentation was costly and Guantanamo went through several reorganizations as new capital was raised year after year to pay for exploration and research. Stockholders came and went as Moa Bay's iron remained underground and the company's bills accumulated. By 1936 most of the owners of the Moa Bay Iron Co. (as it had been named) were anxious to sell out to anyone who would pay its bills.

In that year, Donald M. Liddell, one of the original three founders, came to New York for an important conference. He still had not lost his vision of Cuban ore on the world market. His only problem—and by now it was a big one—was to find someone who would share his faith. He found not one but three people—Harold E. Talbott, Jack Baragwanath and Philip D. Wilson.

Talbott and his associates, known as Pardners Mines Corp., were men who had made spectacular mining investments in the past. With Talbott supplying the financial backing and Baragwanath and Wilson the engineering know-how, they had mined tin in Thailand and gold in Alaska and New Guinea. They, thought Liddell, might be the ones who could get the nickel out of the Cuban iron ore and do something with it.

Pardners checked with Bethlehem, found Liddell's story of rich ore confirmed, and in 1938 sent Wilson (who later was to serve as Vice Chairman



Jack Baragwanath, also of Pardners, helped direct sinking of 500 test pits.

Prospecting group in 1940 included, seated, (l to r) Billy Pitt, F. S. Norcross, Jr., Frank Hayes; standing (l to r) P. D. Wilson, Reid Horner, E. P. Pfleider.

of the War Production Board for Metals and Minerals during World War II) and an assistant to Cuba to explore and develop 1500 acres in claims.

Wilson, then a vice president of Pardners, found the whole area covered with jungle-like growth. No one seemed to know the limits or outline of the claims. They went around collecting old maps of the region and seeking out Cubans who could remember locations of the outcroppings of ore which had been discovered earlier by the Guantanamo Iron Exploration Co. An engineer, Frank Harry Hayes, was sent down, and he and Wilson sank about 500 test pits, sending ore samples back to New York for assay. From time to time, Baragwanath would go down from New York to lend a hand. One pit which went unusually deep brought up samples three times as rich in nickel as the surface ore that had been assayed earlier, and nickel was becoming increasingly valuable in the United States.

Even though the Pardners group was on the trail of a process to extract the nickel, they decided that the investment it would require was beyond the money they wished to speculate. They approached Freeport Sulphur Co. and offered to sell their options. These options included not only claims in the Moa Bay district but holdings at nearby Nicaro in the Mayari area. Freeport, while primarily a sulphur producer, had experience operating in Cuba through its manganese mines at Christo, and its local manager, Fred S. Norcross, knew of the Pardners' orebodies.

Meanwhile, the nickel outlook had shifted. U. S. consumption had jumped from 59,822,000 lb in the boom year of 1928 to 153,000,000 lb in 1940. Most of it came from Canada and further increases in demand could result in a severe shortage in spite of Canada's dominant reserves. Freeport, therefore, decided to take over the options and Pardners Mines sold its holdings at a good profit—which was, after all, what they were in business for. Within a few months it became apparent that the 1941 nickel needs of the U. S.—the "arsenal of democracy"—would fall far short of supply. With Pearl Harbor, the problem became acute.

New Process

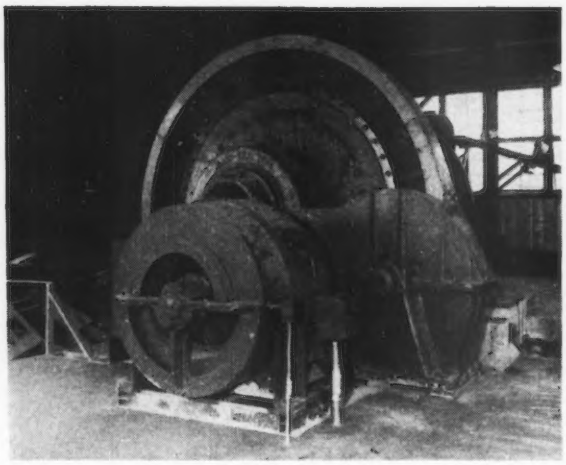
But now there was something new in nickel, Freeport's new subsidiary, Nicaro Nickel Co., had developed an ammonia leaching process for treating Cuban ores. Laboratory tests indicated the new process would be practical on a large scale. A government committee of metallurgists, who had been following development of the process, reported favorably on the laboratory technique and suggested that the next step, a pilot plant, be undertaken. Shortly after the United States entered the war, the committee made another study. Results obtained in a small scale pilot plant bore out the soundness of the process. In January 1942 the committee recommended to the Reconstruction Finance Corp. that it proceed with construction of a full-scale plant in Cuba, capable of treating 3600 tons of dry ore a day, and Freeport was commissioned to design and construct the facilities.

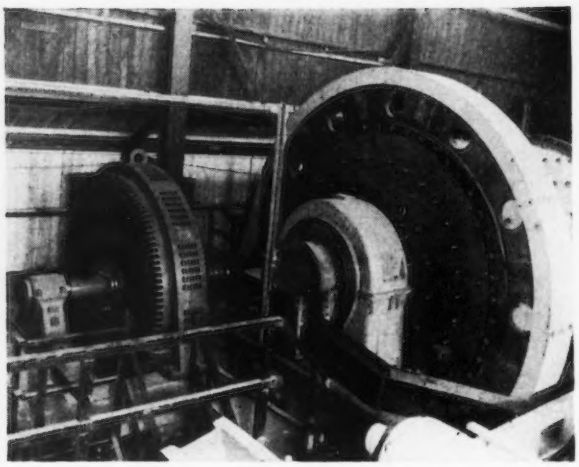
Nicaro was selected as the site since this orebody had been much more thoroughly explored than deposits at Moa Bay. Although Freeport relinquished operation of the plant at the end of the war (See *E&MJ*, June 1954), the venture provided the company engineers with valuable experience in the mining and treating of lateritic ore.

In the years immediately after the war, United States consumption of nickel rose to almost double that of the prewar years. When war broke out in Korea in the summer of 1950 there was not enough nickel available to meet full defense needs, let alone those of the civilian economy. The Government reactivated the Nicaro plant, and vigorous efforts were made to develop sources of nickel elsewhere.

Freeport's Richard Colligan and Forbes Wilson returned to Cuba to explore further the Moa claims which necessarily had been ignored during the war. Hundreds of new holes were drilled into the red clay of Moa and thousands of samples were analyzed. Freeport began to realize that here might lie a richer and more valuable reserve of nickel than any other in the world outside of Canada's Sudbury district in Ontario.

With preliminary planning and pilot plant programs in full swing, the story of Moa Bay is nearing its final chapter—the time when the Moa Bay orebodies will contribute important amounts of nickel and cobalt to the free world supply of these vital metals. When this chapter is written, it will have been made possible by the vision and tenacity of the men of Moa—many men—who devoted so many long years and so much effort to unlocking these resources.





CHOICE OF SYNCHRONOUS MOTOR for taconite grinding units may be a high-speed unit with reduction gears as shown on rod mill at left; or a low-speed motor on ball mill at right. Article tells you how to make proper selection.

How to Select Synchronous Motors For Taconite Grinding Mills

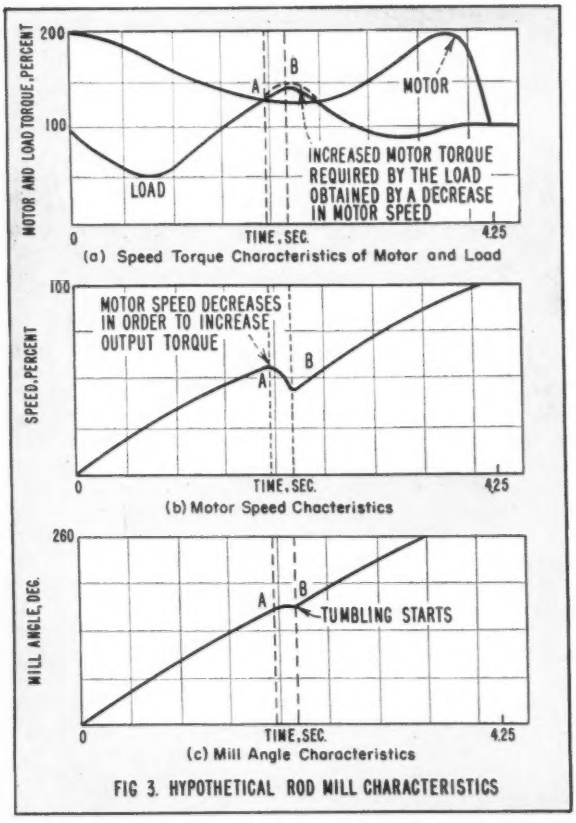


FIG 3. HYPOTHETICAL ROD MILL CHARACTERISTICS

HYPOTHETICAL CASE in which torque developed by the motor is less than the peak torque required by the load just before the charge begins to fall. See text for explanation of how decrease in motor speed slows down the rotation of the mill at critical point to develop greater momentary torque.

J. C. MAROUS, Engineering & Service Division Westinghouse Electric Corp., Charlotte, N. C.

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ONE OF THE MOST IMPORTANT OPERATIONS in processing taconite involves the use of rod and ball mills for fine grinding of the ore. Synchronous motor drives are ideal for both these units because of their high efficiency, power factor correction ability, constant speed performance, and overall economy.

Early application of synchronous motors for driving mills usually made use of clutches or similar devices. This permitted disconnecting the load until after the motor had been brought up to speed and synchronized. Thus it was possible to use synchronous motors possessing relatively low values of starting and pull-in torque. The present trend, however, is to use motors coupled directly to the mill equipment. In addition, the motors are being line started, which further complicates the problems involved in properly applying motors for this type of drive.

The trend towards line-starting direct-coupled motors means that the motor designer has to incorporate very high values of starting and pull-in torque characteristics in the motor design. This is necessarily accompanied by high starting kva demands, which is a matter of great concern when the equipment is operating at the end of a long feeder circuit.

Synchronous motors are applied to ball- and rod-mill equipment in two ways: 1) Using low-speed motors coupled directly to the pinion driving the mill; and, 2) using high-speed motors connected to the pinion through gear-type speed reducers.

This article discusses the torque requirements for rod and ball mills and compares the high- and low-speed synchronous motor drive for this application.

In order to determine accurate torque requirements for ball and rod mills, test runs were made on an actual

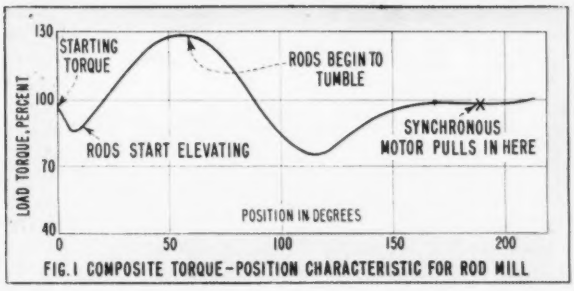


FIG. 1 COMPOSITE TORQUE-POSITION CHARACTERISTIC FOR ROD MILL

What Happens When A Rod Mill Starts Up

EQUIPMENT TESTED: Motor rating: 700 hp, 4000/2300v, 3-phase, 60-cyc, 900 rpm, 80% power factor. Excitation requirements, 5 kw. Pinion speed reduced to 180 rpm by means of 900/180-rpm gear-type speed reducer. Gearing between pinion gear and ring gear connected to rod mill provided a mill speed of 15.5 rpm. Motor and gear inertia at the 900-rpm shaft was 4350 lb-ft² and 640 lb-ft², respectively. Mill inertia at the 15.5-rpm shaft was 5,800,000 lb-ft². Load on rod mill equalled 50 tons of rods with a 60-ton-per-hr feed.

Results of test: Starting torque of the rod mill was 99% of motor rating as shown above. As the mill began to rotate, torque load decreased. After the mill rotated about 10 deg, the load increased because the rods were being elevated. Then the load increased to a peak of about 130% at approximately the 60-deg drum position. Here the rods began to tumble and the load dropped sharply. Load continued to drop to about 78% at the 115-deg point after which it increased moderately. The synchronous motor pulled in when the mill rotated about 190 deg from starting position. Torque at this point was 100%. Time required to accelerate the rod mill was 4.25 sec. Average output horsepower for running conditions as measured by recording wattmeter was 545 hp.

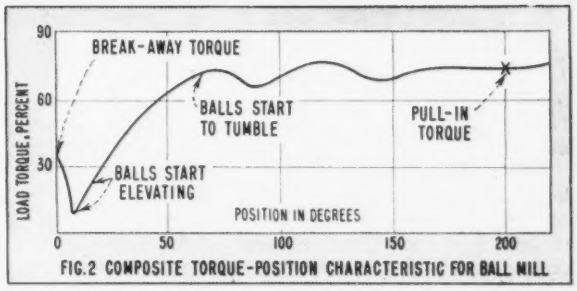


FIG. 2 COMPOSITE TORQUE-POSITION CHARACTERISTIC FOR BALL MILL

What Happens When A Ball Mill Starts Up

EQUIPMENT TESTED: Motor rating, 700 hp, 4,000/2300v, 3-phase, 60-cyc, 180 rpm, 80% power factor. Excitation requirements, 15 kw. Gearing between pinion gear and ring gear of each ball mill provided mill speed of 15.5 rpm. Inertia of high- and low-speed motors tested, 122,600 lb-ft² each, at the 180-rpm shaft. Mill inertia, 5,300,000 lb-ft² at the 15.5-rpm shaft. Mill charge, 61 tons ball load with no feed.

Results of Test: Break-away torque was 37% of motor rating, as shown above. Then load dropped off until balls were elevated sufficiently to cause torque load to increase. Load torque increased until it reached a maximum when the drum had rotated 70 deg from starting position. At this point torque varied slightly above a constant average value. Pull-in torque of the ball mill was about 78% of full load torque, and occurred when the mill had rotated approximately 200 deg from the starting position.

Average output of the mill was 512 hp.

Ball Mill Vs. Rod Mill Characteristics

Rods are elevated to high point before tumbling because of lifters, hence the higher torque peak. Rod mill motor operated at 77% of motor rating while ball mill motors operated at 73% of motor rating.

installation. See Figs. 1 and 2 and summary of the results of these experiments.

Based purely on the conditions of the tests, it appeared that the rod mill motor was operating at 77% of the motor rating while the ball mill motors operated at 73% of the motor rating.

However, when specifying ratings and torque values for rod and ball mills, you must consider all the factors which can increase the load requirement at a future date. Such factors include: Increase of the charge, addition of mill grates, speed increase, and the addition of charge as the mill liners wear. Because of these factors, the motor rating should be specified in excess of that required.

One of the most important considerations in the matter of torque requirements for rod mills is illustrated in Fig. 3. A hypothetical case is represented in which the torque developed by the motor is less than the peak torque required by the load just before the charge begins to fall. It is significant that if the motor develops torque greater than the maximum required by the load at any point before the load reaches its peak—usually during starting—the mill can be started.

Torque characteristics of the motor and the load versus time are shown in Fig. 3 (a). If the peak of the load torque curve were a function of speed instead of time, the mill could not be started because at point "A" the load torque is equal to that developed by the motor and no further torque is available for acceleration. In the case of a rod mill, however, the torque peak of the load is a function of the *position* of the mill and not of its *speed*. Consequently, even though the motor starts to slow down to a lower speed in order to increase its output torque, the drum is still advanced in a positive direction. As soon as the drum has reached the critical angle at which the rods will fall (point "B"), the load on the motor is reduced considerably, thus providing sufficient accelerating torque to bring the mill completely up to speed. Fig. 3 (b) shows motor speed characteristic for this condition. In Fig. 3 (c) the mill angle characteristic is shown.

Motor Rating for Rod Mill

Starting Torque. Since the peak-load torque is considerably higher than the breakaway torque, it becomes the chief factor to be considered. The maximum load torque was found to be 130% on a 700-hp nameplate rating. However, the average load was found to be only 545 hp, as previously noted. Therefore, if the motor rating was exactly matched to the average mill loading (i.e., if a 545-hp motor were applied to the mill in question), the maximum torque required during starting would be

$$\frac{130 \times 700}{545} = 167\%$$

of motor rating. Also, if grates or additional charge were added to increase the operating load of the mill to 700 hp, a maximum torque during

starting of 167% would be required for the 700-hp motor considered here.

Therefore, a fully-loaded rod mill requires at least 170% starting torque to be certain of starting. In order to allow for line drop, and still maintain 170% torque, the motor should be specified to have 200% starting torque.

Pull-in Torque. Since the charge of rods in the mill has begun to tumble by the time the motor has reached 95% speed, maximum load at pull-in will be the maximum load that the motor carries in normal operation. In the case of the rod mill installation, the peak horsepower was about 605, as found by a recording wattmeter trace. This is 11% above the average horsepower and would represent 780 hp as the maximum load against which the motor must pull in if it were fully loaded.

On this basis, a specified pull-in torque of 125% would be adequate to pull the mill into step.

Motor Rating for Ball Mill

Starting Torque. The load characteristic curve of the ball mill varies from that of a rod mill. Although the peak torque of a ball mill is also a function of the mill position, once the peak torque is reached it remains fairly constant. Also, the peak torque in a ball mill is much less than that of a rod mill, thereby permitting smaller torque ratings.

As in the case of the rod mill, the load is more important than the static friction at breakaway. Part of this is accounted for by the fact that the mills tested had a hydraulic oil lift and the mill was not shut down for any great length of time before the test started. The maximum torque of the ball mill was found to be 75% of motor rating. The average load as determined by the running tests was found to be 512 hp. This would correspond to 102% if the operating load of the mill were increased to 700 hp, because $\frac{75 \times 700}{512} = 102\%$.

Considering the possibility of an increased static load, it is believed necessary to provide a starting torque of 160% of average full load torque. To account for line drop, a minimum starting torque of 180% should be specified.

Pull-in Torque. The pull-in torque requirements of a ball mill are also different from that of a rod mill. High peak loading is expected in rod mill applications because of the nature of the charge. In ball mills, however, since the charge tumbles at random, high peak loads are unlikely.

Maximum torque at pull-in was found to be 75% with a 512-hp average load. This represented a pull-in torque of 102% with a 700-hp load. This torque requirement remained fairly constant during the remaining accelerating period and also for the running period. In view of this loading, a pull-in torque of 120% should be adequate for this application.

High-Speed Vs. Low-Speed Motors

A general comparison of the two types of motors requires that each be considered from several standpoints, including installation and maintenance cost, initial cost, and power cost.

Installation and Maintenance. The same normal care exercised when installing any large motor applies equally well to either of the synchronous motors used to drive rod and ball mills. The units should be properly handled, being certain that, when lifting, the slings are so arranged that the weight is equally distributed to avoid distortion of the bedplate. It must be installed so it is well ventilated and yet not exposed to moisture or other injurious substances.

The foundation of either motor should consist of solid concrete with dimensions to suit the outline drawing of the motor. A rigid foundation will eliminate many troubles originating from vibration and misalignment. The foundation of the low-speed motor is more expensive than that for the high-speed motor because of the larger foundation required. It is also necessary to install a pit approximately four feet deep in the foundation for the low-speed motor. Moreover, the high-speed motor, even with the speed reducers, is easier to install since it is lighter and more compact. This advantage is very important when a large number of motors are involved since the size of the building can be greatly reduced.

Except for the weight of the low-speed motor, the alignment problem is more involved on the high-speed unit. The high-speed motor requires coupling alignment between the ball-mill pinion and speed reducers and between the speed reducer and the motor. From past operating experience this item has proved to be a big factor. The low-speed motor only requires coupling alignment between the ball-mill pinion and the motor. However, alignment of the bearing pedestals to insure proper gap dimensions is required for the installation of the equipment.

The low-speed motor is easier to maintain because the stator may be shifted to provide easy access to the rotor or stator winding. Also, the speed reducer unit and coupling used with the high-speed motor are additional pieces of equipment which increase the maintenance.

Initial Cost. The initial cost of high-speed and low-speed motors used for these applications, using the price of the high-speed unit as 100%, is shown below:

Low-Speed Motor —	Motor	113%
	Exciter Set	7%
	Total	120%
High-Speed Motor —	Motor	63%
	Gear	33%
	Exciter Set	4%
		100%

A net savings in initial cost can be realized using the high-speed motor despite the fact that it is necessary to include a speed reducer with the high-speed motor. It must be remembered that although the price differential is not too great for one unit, the savings becomes sizeable when purchasing a large number of units.

Power Cost. A net saving in power costs is also realized using the high-speed motor with a gear reducer having an efficiency of 98%. This saving can be shown as follows:

$$\text{Efficiency (high speed)} = \frac{\text{Output}}{\text{Output+losses}} = \frac{522}{522+26.51} \times .98 \times 100 = 93.5\%$$

$$\text{Efficiency (low speed)} = \frac{\text{Output}}{\text{Output+losses}} = \frac{522}{522+41} \times 100 = 92.8\%$$

$$\text{Difference} = 0.7\%$$

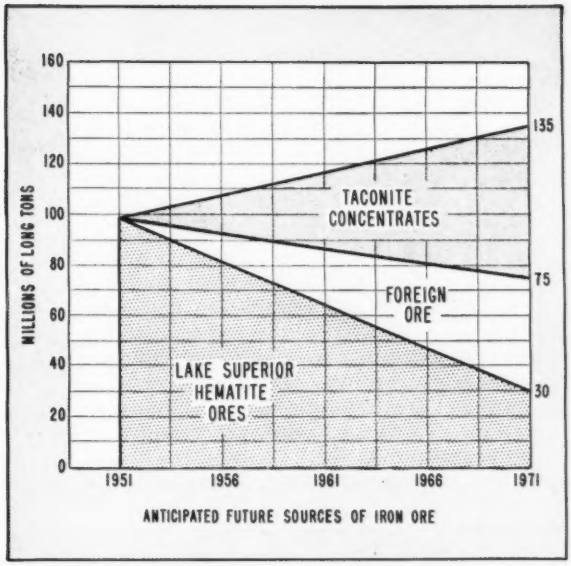
Net savings per mill = .7x522 = 3.65 kw, using high-speed motor.

Therefore, for a total of 100 motors used in an entire plant, a total saving of 365 kw will be gained from using the high-speed motor and gear reducer drive unit. This results in an annual savings of $32,000 considering the cost of power at 1c per kwh, and a 168-hr work week.

Summing It Up

Two important factors must be considered when applying synchronous motors to rod and ball mills: load characteristics and economics.

The most important point to consider when specifying the various torque values is the fact that load varies with the mill position and not speed. Taking this factor into



The timeliness of this authoritative article on synchronous motor drives for rod and ball mills in the taconite industry is clearly evident from the anticipated output of taconite as compared with foreign ore and Lake Superior ore in the above chart.

account, and those found from the analysis of the test, it was concluded that the following torque values are required:

	Rod Mill	Ball Mill
Pull-in torque	125%	120%
Starting torque	200%	180%

As far as performance is concerned, either the high-speed or low-speed motor is satisfactory. The choice of a synchronous motor should be based upon the chief economical variables: weight, floor space, initial cost, and ease of installation and maintenance. The case for each type of motor may be summarized briefly as follow:

HIGH-SPEED MOTOR

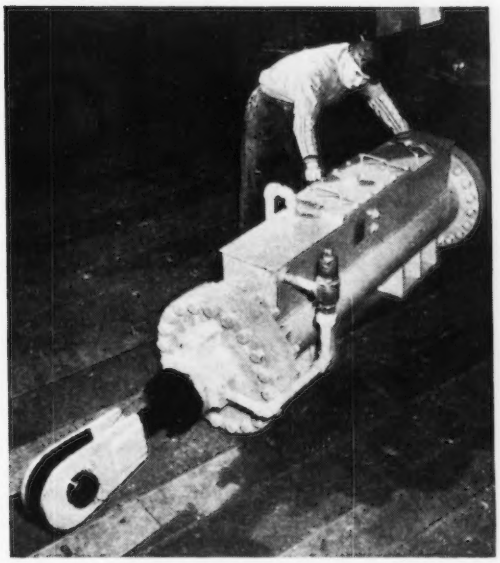
Advantages: Smaller and more compact; requires no pit in foundation; more efficient.

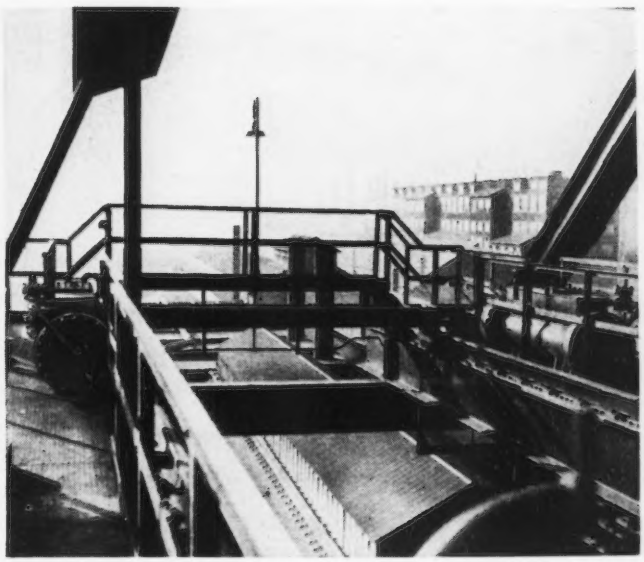
Disadvantages: Alignment required between motor and speed reducer as well as between speed reducer and ball-mill pinion; must be disassembled to gain access to stator and field windings; gear unit is one additional piece of equipment to be maintained.

LOW-SPEED MOTOR

Advantages: Stator may be shifted to work on rotor and stator windings; requires alignment between motor and pinion only; requires motor maintenance only.

Disadvantages: Large and bulky; requires pit in foundation; less efficient.



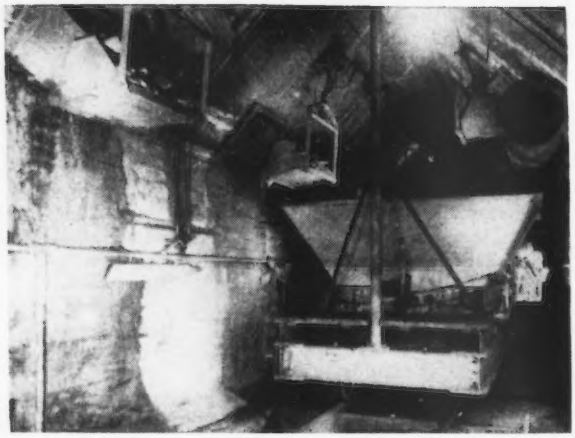


TWO HYDRAULIC BUFFER UNITS with 6-ft stroke (left) are mounted on either side of the trolley runway of ore bridge crane (above). Crossbeam engages crane and brings it to a gradual stop.

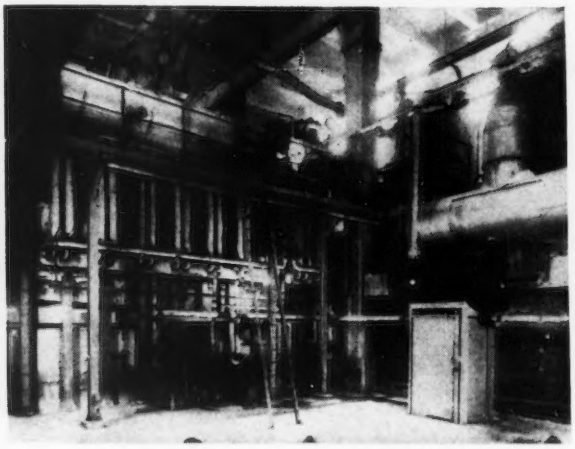
Hydraulic Buffer Eases Crane Travel to Smooth Stop

UNLOADER MAN TROLLEYS on bridge cranes handling ore may present an industrial hazard unless equipped with an effective buffer mechanism to bring the crane to an easy halt at the extreme end of travel. Realizing this possibility, Dravo Corp., Pittsburgh, Pa., has devised the hydraulic buffer unit shown at left which will bring a 15-ton, 151,000-lb bridge traveling at 900 fpm to a safe halt if it fails to decelerate properly. This weight is exclusive of bucket and load.

As shown in the installation at right, a crossbeam connected to two hydraulic buffers with 6-ft stroke engages the traveling crane and slows it to a stop. The buffer action is produced by a variable sleeve orifice in the cylinder which diminishes the exit flow of hydraulic fluid smoothly from high discharge at the start of impact to low discharge at the end of piston stroke.



THE ORE
Smelter charge of copper-bearing pyrites is mixed in this tunnel . . . . conveyed to the tops of furnaces, ...



THE WASTE GASES
Sulphur bearing gases go through Cottrells, catalyzers . . . . . to be cooled in waste heat boilers . . . . . .

Smelter Gases Yield Elemental Sulphur

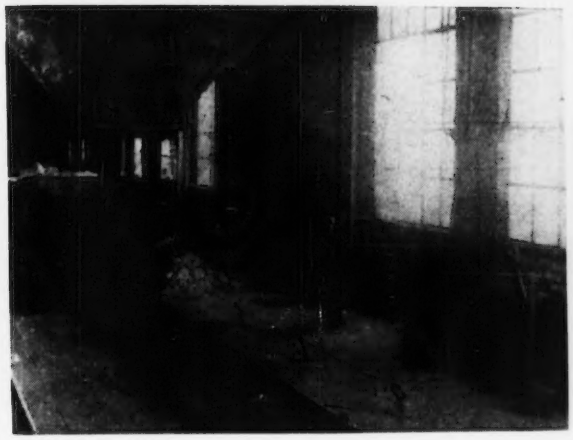
THORRY KIAER, Managing Director
Orkla Grube-Aktiebolag, Lökken Verk, Norway

Orkla Smelting Plant at Thamshavn which produces by-product sulphur from copper-bearing pyrite concentrates.

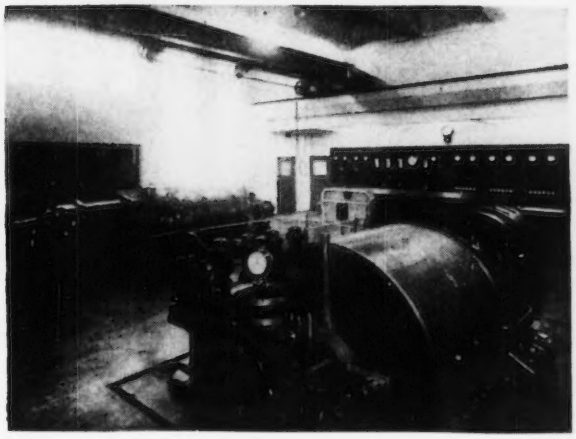
ELEMENTAL SULPHUR is produced as a by-product from copper-bearing pyrites at the metallurgical plant of Orkla Grube-Aktiebolag, Lökken, Norway. Average analysis of the Lökken pyrites and other metallurgical details of the process are shown in the tables on page 90. Note that sulphur content is 41%.

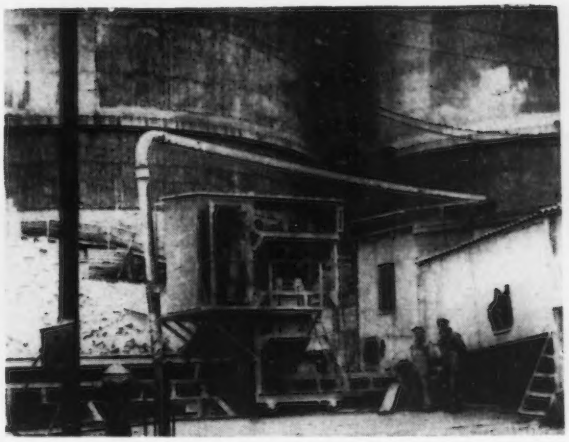
In brief the process operates as follows: Lump pyrite is mixed with coke and the fluxing agents, silica and limestone. This charge is smelted in water-jacketed furnaces. Part of the contained sulphur is distilled off in the upper part of the furnace, while FeS is oxidized to form FeO and SO_2 in the smelting zone of the furnace. The SO_2 in the smelting zone is reduced to sulphur and CO_2 in the furnace shaft with the aid of coke which is used only as a reducing agent, and not a fuel.

FeO reacts with the silica and limestone to form a slag containing approximately 80% $2(FeO)\cdot SiO_2$ and about 15% $CaO\cdot FeO\cdot 2(SiO_2)$. The copper plus some of the FeS forms a matte running about 12% copper. This slag-matte melt is separated in forehearths illustrated in the accompanying sketch. The slag contains about 42% Fe, mainly as silicates.



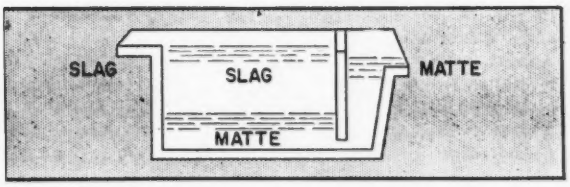
. . . charged through these bells, ... and smelted in this battery of furnaces.





. . . yielding power in these turbo-generators, ... and sulphur which is granulated and stored here.

at Orkla-Grube Plant in Norway



Sketch of forehearth used to separate slag and matte

Gases leaving the top of the furnace contain about 300g sulphur per cu m (temperature 450 deg C), CO_2, and various sulphur compounds in the form of SO_2, H_2S, COS, and CS_2. These gases are cleaned in dust flues and then passed through a catalyzer which promotes the following reactions:

$$SO_2 + 2H_2S \rightarrow 2H_2O + 3S$$
$$CS_2 + SO_2 \rightarrow CO_2 + 3S$$
$$2COS + SO_2 \rightarrow 2CO_2 + 3S$$

Gases leaving the catalyzer are cooled from 450 deg C to 130 deg in waste-heat boilers. Most of the sulphur is condensed in the boilers. Then the gases are washed by the injection of liquid sulphur in scrubbers, reheated in heat exchangers to about 300 deg C, and passed through a second catalyzer. Sulphur formed in the second catalyzer is precipitated in cooling towers, and scrubbed with liquid sulphur. SO_2 contained in the tail gases is absorbed in towers filled with limestone, and sprayed with sea water to prevent damage to surrounding vegetation. In a final step the sulphur is washed with milk of lime to remove arsenic, and then granulated or molded.

Matte produced in the furnace is upgraded to about 40% copper by resmelting with coke, silica, and limestone. Conventional converters and electrolytic circuits are used to produce refined copper. In the overall process, copper recovery is about 84 to 85% and sulphur, about 85 to 86%.

Sulphur production at Orkla now totals 115,000 tons per year; matte production, 15,000; and copper production, 6,000. The company's first plant was built in 1931 at Thamshavn, about 30 km from Lökken. In 1936 plant capacity was doubled, and it now is able to process 330,000 tons of ore per year. Similar plants are licensed in Spain, Portugal, and Russia. (*Please turn page*)

Tables of Metallurgical Data for Orkla Smelting Process

Table I. Composition of Furnace Charge and Intermediate Products

	Tons	Cu %	Fe %	S %	SiO_2 %	Zn %
Pyrites	29.980	1.866	38.149	41.018	12.95	1.922
Quartz	4.826				95.00	
Limestone (95% $CaCO_3$)	1.837					
Coke (11% ash, 16% H_2O)	4.144					
Lean matte	4.591	11.355	54.00	24.00		
PRODUCTS:						
Rich matte	1.384	37.44		24.24	0.04	
Slag from matte furnace	4.426	0.50		2.13	29.55	
Slag from pyrite furnace	21.555	0.27		2.67	34.33	
Dust from gas mixer	105			21.06		
Dust from Cottrells	152			15.22		

Table II. Exit Gases From Furnaces

Gases	Percent by Vol.	g per cu m	g per cu m C	g per cu m S
S		300.–		
CO_2	13.2		71.0	
CO	0.2		1.1	
O_2	0.5			
SO_2				24.92
H_2S				11.62
CS_2		28.8	7.1	21.70
COS		22.3	4.0	18.83

Table III. Determination of the Volume of Gas Per Ton of Pyrites Smelted

	Kg of Carbon per ton Pyrites
Carbon charged to the furnaces as coke	100.9
Carbon charged in limestone	7.0
Total carbon charged to furnaces	107.9

Carbon in Exit Gases	g Carbon per cu m
CO_2, 13.2 per cent by volume	71.0
CO, 0.2 per cent by volume	1.1
COS	7.1
CS_2	4.0
Total	83.2

The volume of gas per ton pyrites is: $\frac{107.9 \times 1000}{83.2} = 1300$ cu m

Table IV. Sulphur Balance

	Kg per ton pyrites
Charged sulphur	410
Sulphur combined with Cu, Zn, etc.	15
Sulphur in FeS_2	395
Volatile sulphur (42% in FeS_2)	166
Sulphur in Fe_7S_8	229
Sulphur combined with Cu, Zn, etc.	15
Fixed sulphur entering smelting zone	244
Sulphur in matte $\frac{1.384 \times 24.24}{29.980 \times 1000} = 11.2$	
Sulphur in slag $\frac{669,800}{29,980} = 22.3$	
Sulphur in dust $\frac{62,100}{29,980} = 2.1$	35.5
Sulphur oxidized to SO_2	208.5
Sulphur as SO_2 not reduced in the gases from the furnaces: $\frac{24.92 \times 1,300}{1,000} =$	32.4
Sulphur produced by reduction of SO_2	176.1

The above tables pertain to the feed, products, by-products, and intermediary products involved in the production of elemental sulphur at Orkla Grube-Aktiebolag's smelter Thamshavn, Norway, pages 88 and 89.

Average Analysis of Lökken Ores in Percent

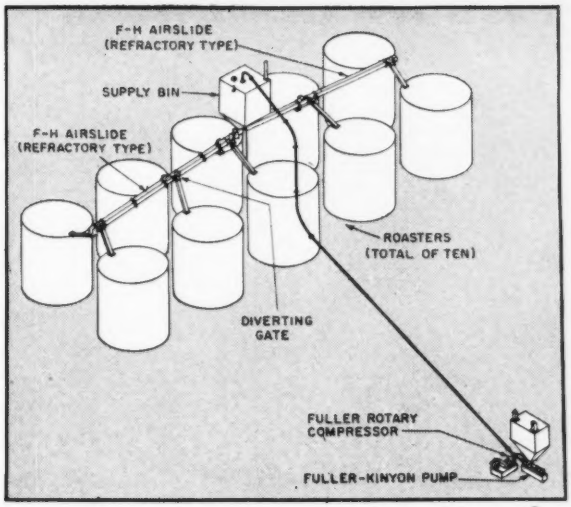
S	41.0
Cu	1.8 - 2.5
Fe	38.0
Zn	1.9
Co	0.1
SiO_2	12 - 16
Al_2O_3	0.3
CaO	0.8
MgO	0.3
As	0.05
Se	0.005
Ag	20. g/ton
Au	0.2 g/ton

Slag and Matte Analyses in Percent

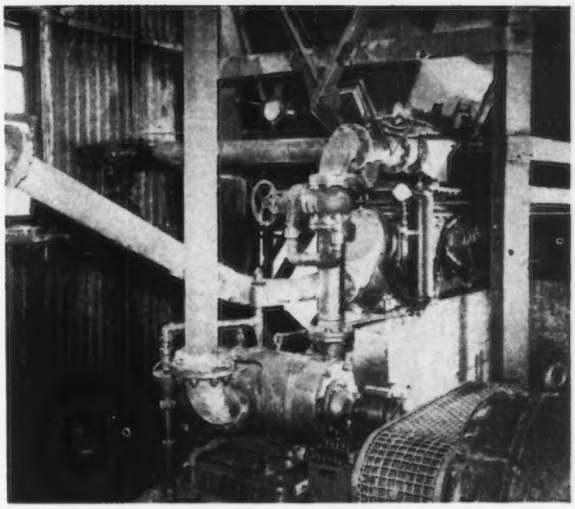
	Slag	Matte
Cu	0.3	38.50
Fe	42.0	32.46
S	2.3	25.55
SiO_2	33.5	0.14
Zn	1.6	–––
CaO	4.5	–––
Al_2O_3	1.4	–––
MgO	0.13	–––
Co	–––	0.11

Major Equipment Installed in the Orkla Plant

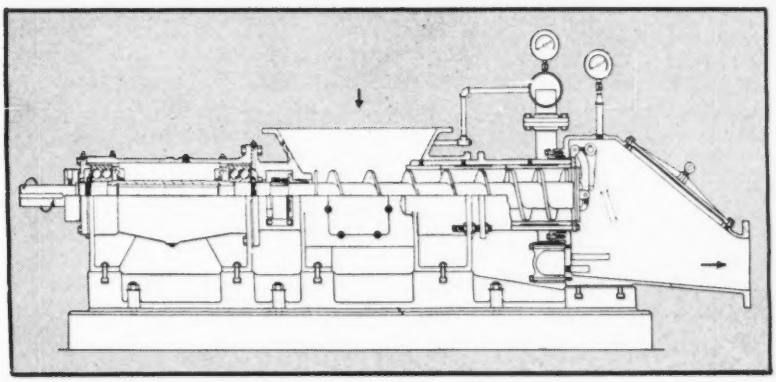
8 water-jacketed furnaces
19 Cottrells 60,000 volt
8 first catalyzer-chambers
4 boilers
6 gas scrubbers (with liquid sulphur)
2 heat exchangers (with oil burners)
2 second catalyzer-chambers
2 gas cooling towers (circulating sulphur)
2 gas scrubbers filled with Raschig rings
2 Cooling towers (seawater injection)
9 towers for limestone
Steam turbine station with superheater, turbines, and generators.



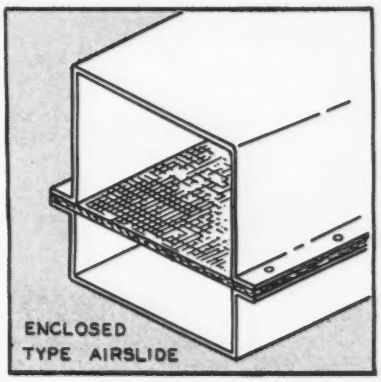
Pneumatic conveyor carries 800 deg F dust from pump to supply bin above roasters, from which it is distributed evenly.



Dust feeds from hopper into pump (above). Compressor, which provides air at 15 psi, delivers the hot dust.



Drawing shows operation of system. Screw-conveyor element feeds dust into air-mixing chamber where it is made fluent by compressed air.



Section of Fuller-Huron "Airslide" shows aluminum oxide "support."

Hot Dust Is Conveyed Pneumatically From Precipitators to Furnaces

DUST RECOVERED BY COTTRELL PRECIPITATORS in the roasting of metallic sulphides at the Noranda Smelter, Noranda, Quebec, Can., is returned and distributed evenly to the roasting furnaces at temperatures from 500 to 800 deg F by a special pneumatic conveying system. A more efficient roaster operation is provided when the dust to be reprocessed is returned hot.

The dust from the Cottrells is gravity fed from a hopper into a Fuller-Kinyon pump. A screw element of the pump (see drawing, lower left) feeds the dust into an air-mixing chamber in which it is made fluent by compressed air. From the mixing chamber, compressed air at 15 psi delivers the dust through a conveying line to a supply bin placed above the roasters.

Dust is fed uniformly from the supply bin (see drawing, top left) to the bank of ten roasting furnaces by means of a Fuller-Huron Airslide.

Uniform Feed

The chute is comprised of an enclosed porous medium—in this case, refractory aluminum oxide—which supports the stream of dust. Low-pressure air, passing through the aluminum oxide (see drawing, lower right), fluidizes the dust sufficiently so that gravity causes it to flow.

A special feature of the installation at Noranda is the use of a refractory —the aluminum oxide—as the porous medium. For most applications at normal temperatures a fabric is used as the support in the chute's divider.

The installation at Noranda, handling the 500- to 800-deg dust, however, required a refractory because of the perishability of a fabric medium, which, while suitable for conveying cement, gypsum, lime and iron ore, cannot handle hot dusts.

Advantages of the new system over the old include: (1) use of expensive high pressure air is eliminated; (2) cooling effect of blowing air is reduced; and (3) fuel ratio is improved by uniform feed.

Two other mining firms, faced with similar problems, are installing systems like Noranda's.

FIG. 1. IN 1932, advertisement illustrates detachable and integral type tungsten carbide bits.

FIG. 2. IN 1935, pusher-type light-weight drill was introduced by DEMAG. Note annular ring near steel shank which feeds water to bit.

Progress in Tungsten Carbide Drilling In Germany—1932 to Date

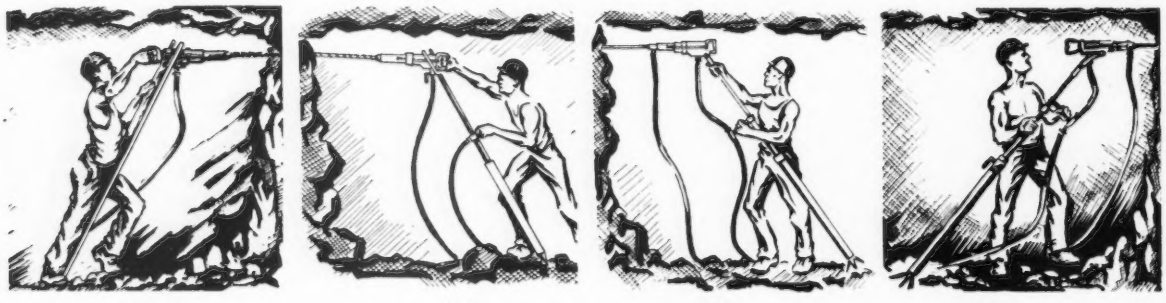
DR. ING. H. JESCHKE
Duisburg, Germany

DURING THE PAST DECADE, the lightweight feed-leg rock drill in combination with tungsten-carbide bits has achieved worldwide acceptance. However mining literature has not given an extensive account of the early development of this technique, and many engineers are not aware of the fact the pioneering work on tungsten carbide bits and lightweight feed-leg drills was actually done in Germany considerably before similar work was done in Sweden and the U.S. and Canada. Accordingly this article sets forth some of the high spots in the history of tungsten carbide drilling; also traces the progress of design of this type of rock drilling equipment in Germany to date.

In the early thirties (1930-40) Krupp started work on the development of rock drills using hard-alloy tungsten carbide bits developed by the German firm Osram. The hard cemented-carbide called WIDIA (Wiediament or hard as a diamond) still ranks as one of the best cutting alloys of its type. Fig. 1 is interesting because it is part of an advertisement that appeared in 1932 showing how early the tungsten carbide development really was. Also note that both the integral and detachable bit features were already developed at that time.

Although this work of Krupp's met with only limited success, it nonetheless exposed the unusual difficulties inherent in the use of hard-alloy bits for percussion rock drills, also the tremendous advantages the equipment offered over conventional drilling equipment in hard rock.

Independently of these endeavors, other German companies were work-



1906 1924 1934 1950

FIG. 3. EVOLUTION OF THE "PUSHER LEG" from wooden drill-board in 1906 to telescopic pneumatic feed leg in 1950.

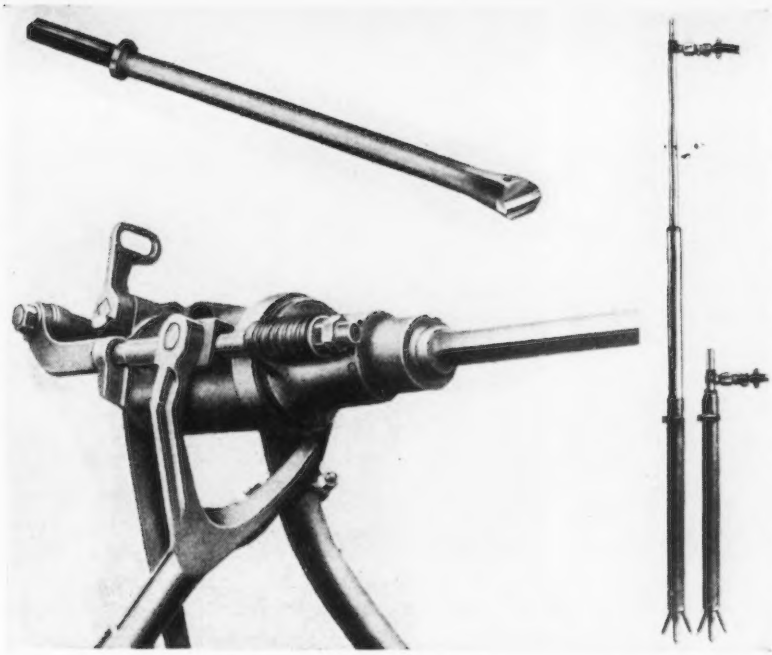


FIG. 4. OTHER IMPROVEMENTS included integral bit, upper left (1936); fork-type drill mount, lower left (1951); and telescopic feed-leg, right (1951).

ing on hammer-drill supports which would prove versatile for drilling in all directions, and cut down the required efforts of the drill runner. Fig. 3 shows the evolution of the so-called pusher-type feed leg. Among the pioneers in this field, the German firm Flottman deserves special recognition.

In 1935, after extensive plant tests, Demag developed a successful hammer-drill support to be used in conjunction with tungsten carbide bits. This new drill, called the FNH 60, also contained an annular water ring which introduced flushing water directly into the steel instead of through the rock drill. Hammer cylinder diameter was 60 mm; stroke, 45 mm; and weight, 15 kg. See Fig. 2. The hammer support was clamped to the handle.

This type of drill is still in use today in addition to others with added improvements. Outstanding features of the drill included a moderate striking force, high striking rate, and short stroke. Drills of this design were equipped with screwed-on tungsten-carbide bits.

Then it was learned that direct fastening cemented carbide bits (integral type) not only lowered the price of equipment, but also enabled the drilling of smaller holes. This led to the development of integral type drill bit built by Demag and shown in Fig. 4.

By 1938 this technique advanced to such a stage of perfection that the author was able to report on the subject,[1] and it is believed to be the first technical article published on results obtained with percussion tungsten-carbide rock drills. Another article followed in 1941.[2] Meanwhile other German firms took part in the development of this equipment, Demag however remained the leading influence.

It therefore appears that the term "Swedish" drilling method applied to tungsten-carbide drilling with feed-leg drills is somewhat misleading since the first tests were initiated in Sweden in 1942, or at least seven years after similar work in Germany.[3]

During 1943 output of tungsten-carbide drills in Germany totaled about 15,000 drills per month despite the difficulty of obtaining tungsten. The bulk of these drills were produced by Walram and Demag.

Experiments over many years in Germany have revealed the following facts about this new drilling technique:

1. Initial difficulties encountered in the manufacture of drills to be used with tungsten-carbide bits have been definitely solved.

2. Superior economy of this drilling method, at least in hard rock, has been conclusively established.

Having established these two accomplishments, drill technicians then concentrated on further reducing drilling costs by improving the overall system of drilling with this equipment. Items taken into consideration in these cost-cutting studies were:

1. Wage costs, chiefly salaries and bonuses to miners.

2. Tool costs, i.e., expenditures for maintaining drills in working order.

3. Cost of setting up machines including accessories.

4. Power costs, chiefly compressed air.

All of these costs were calculated per meter of hole drilled or per liter of hole capacity.

Tests soon revealed that wage costs and tool costs constitute 75 to 80% of total drilling expenditures, while machine costs and power costs were considerably less.

In determining wage costs it is important to note that drilling rate is not the only factor influencing the total. Another factor, delays called "off periods," such as time lost while steels are being changed, also contribute to higher costs.

Tool costs in the main are dependent upon the rate of wear of the tools. But they also depend upon the mechanical load, i.e. extent of tensile, compressive, and bending stress applied to the drill parts. A reduction of wage costs obtained by increasing drilling rate can be uneconomical if it is "bought" at the price of an increase in tool costs resulting from higher stresses on the drills.

Therefore, it appears desirable to seek a high output with moderate striking force. As the output is proportional to the square of the cylinder diameter, and the striking force is proportional to the cylinder capacity, it is necessary to impart to the hammers a large cylinder diameter with short stroke, therefore a high striking rate.

A reduction of the "off periods" (idle time) can be obtained by reducing the frequency of drill changes, and by assuring the easiest possible operation of drilling equipment. Preference should therefore be given to hammer supports with great extension length and short overall length, and at the same time moderate weight.

To utilize the full power inherent in the hammer, the bit must be pressed against the rock with a certain force —this force being a function of the cylinder diameter and the operating pressure. All systems that enable the driller to obtain this rather closely

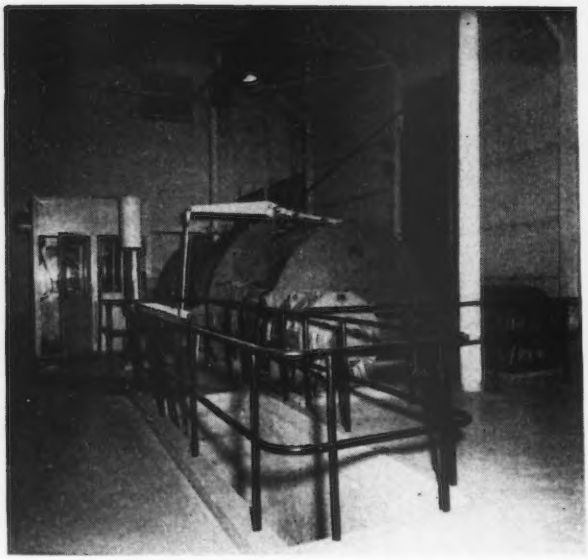
(Continued on p 102)

[1] H. Jeschke: The drilling of blastholes in quarries by means of tungsten-carbide drill bits. "Steinindustrie und Strassenbau" 1938, No. 8.

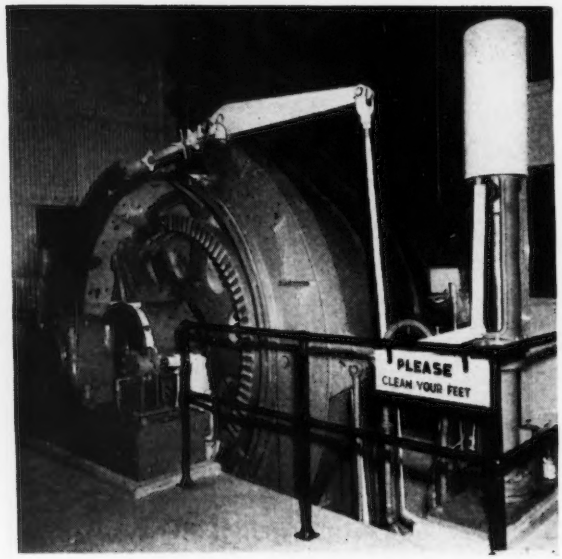
[2] H. Jeschke: The use of carbide alloys in percussion rock drills below the ground. Glückauf 1941, No. 40.

[3] G. E. Sandstrom: Operation Granite, Industria International 1953. (Mentions that first practical drill tests with tungsten carbide bits were conducted in Sweden in 1942.)

[4] O. Rüdiger and W. Kinna: The mechanical stress of drill rods in percussion rock drilling. Glückauf 1953, No. 49/50.



NEW DOUBLE-DRUM HOIST of Potash Co. of America at Carlsbad, N.M., handles 7,737 tons of potash ore per 24-hr day.



HOIST IS EQUIPPED with positive multiple-tooth type clutch. One clutch cannot be engaged while other is out.

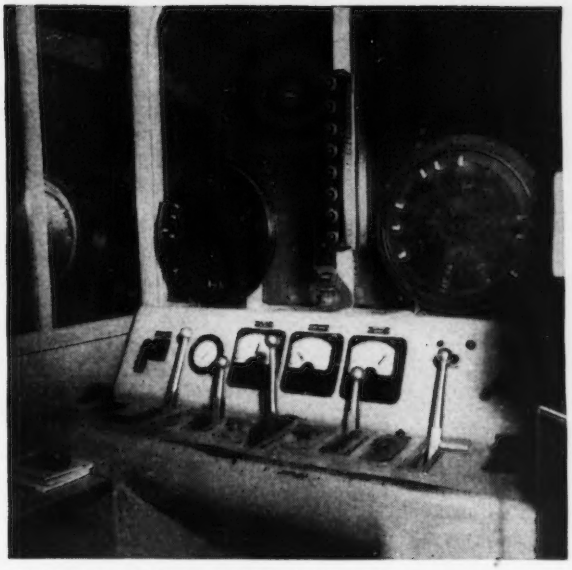
PCA's New Double-Drum Hoist Boosts

HEADFRAME OF PCA'S CARLSBAD, NEW MEXICO, PROPERTY where Nordberg mine hoist raises 8.7-ton skiploads of potash ore 1150 ft at a maximum speed of 1500 feet per minute.

A NEW 10-FT DOUBLE DRUM Nordberg mine hoist is handling ore at the Carlsbad mines of Potash Co. of America at a rate never before achieved at this installation. For example on Feb. 1, 1954, 7,737 tons of ore were hoisted, compared with 5,247 tons on Feb. 12, 1949—the highest volume attained before installation of the new unit. In addition to this 51.3% gain in production capacity, maintenance requirements have fallen off sharply.

Since PCA's 24-hr-per-day operations turn out the largest tonnage of refined product of any of the five major potash producers, it is obvious that the hoist cannot be allowed to become a production bottleneck. The first Nordberg hoist installed at this mine had already seen 19 years of service at the Old Dominion copper mine at Globe, Ariz., before it was moved to Carlsbad in 1935. Originally it was powered by a 400-hp motor, but this was replaced by a 600-hp motor in 1943. The hoist handled skips with a net load of 5.2 tons at a speed of 1000 fpm. Peak tonnage hoisted was 1,010 skips in 24 hr totaling 5,247 tons.

However, since this did not meet the expanded production goals set by PCA, a new and larger Norberg hoist was installed in 1949. The new double-drum unit is powered by a pair of 500-hp General Electric dc motors through a single-reduction herringbone gear unit. One drum is fixed to the drive shaft; the other is



CONSOLE OF NEW HOIST which can be operated manually or automatically. Complete counterbalance cycle takes 72 sec.

ELECTRICAL CONTACTS CONTROL acceleration, full-speed run, deceleration, dumping, loading, and safety.

Production Capacity by 50%

driven through a positive multiple-tooth clutch. Drums are 10 ft in dia, with a 78-in. winding face capable of winding 1400 ft of 1⅝-in. rope in single layer. Each drum is provided with a parallel-motion post brake. Brakes are 10 ft in dia, and have molded asbestos brake blocks.

Rated Capacity Is 400 TPH

The new hoist handles counterbalanced skips with average ore capacity of 8.4 tons. Skip and cage weigh an additional 12,000 lb. At full capacity the hoist is rated at 400 tons of potash per hr. Active vertical depth is 1150 ft below the dump in the headframe.

Automatic control equipment is an outstanding feature of the new installation. With one skip in fully dumped position and the other fully loaded, the operator switches to automatic operation, and the hoist then continues to function on a precise schedule without human control or guidance.

Steps in the hoisting cycle are as follows: acceleration, 10 sec until hoist reaches top speed of 1500 fpm; full speed run, 36 sec; deceleration, 10 sec; dumping time with one skip in headframe and other being loaded at pocket, 16 sec. This cycle is repeated continuously until the hoist is shut down or switched back to manual control.

This new hoist has been an important link in the increased production program at Carlsbad. Ore is brought to the loading station in cars pulled by trolley locomotives. After passing over scales the cars go to the rotary dumper which delivers the ore to a crusher and storage bin above the skip loader. As skips descend, they depress the loading spout and the ore runs into the skips. Then, when the skip moves up again, the spout is raised, stopping the flow of ore.

The automatic controls are set to regulate two important actions: (1) spotting the skip at a point which will permit the skip to be fully loaded, and (2) retaining the skip in this position just long enough to allow complete loading.

The control console, housed in a 5x7-ft steel and glass structure, contains a hoist-speed indicator, voltmeter, dc ammeter, two gear-driven dial indicators showing skip position, manual controls, and automatic and semi-automatic switches. Because of the large capacity of the new hoist, it occasionally gets ahead of the ore supply in the loading bin. When the operator sees by the dc ammeter that the skips are starting to run with a light load, he shuts down the hoist for about 10 min to let ore accumulate, then on signal puts the hoist back into automatic operation.

Three factors contribute to the higher production rate of the new hoist: (1) with more power, it can handle a larger skip with actual loads that average 8.7 tons; (2) rope speed has been increased by 50% to 1500 fpm (loading time per skip is greater of course, but only in ratio to the larger quantities handled); (3) automatic controls with precise acceleration and deceleration permit optimum use of hoisting machinery.

All of these factors resulted in the peak hoisting of 920 skips totaling 7,737 tons in a 24-hr period during which the hoist was idle 3 hr for shift changes and similar delays.

Hoist Is Fully Protected

Safety equipment includes a GE control system; two Lilly controllers which break the drive-motor circuit and apply the brakes in case of power interruption, overwind, a start in the wrong direction, overspeed, or failure to slow to the predetermined speed at the end of the run. A signal bell warns the operator before the controller acts. Control levers are arranged to prevent release of the clutch until the brake is fully applied, and the brake cannot be released until the clutch is again engaged.

Dc power for the two 500-hp hoist motors is supplied by a 750-kw dc generator driven at 900 rpm by an 1100-hp synchronous motor. Two basic sources of power are the plant's own Nordberg diesels, and a line from a utility company system. A separate 5-kw Amplidyne generator driven by a 7.5-hp induction motor provides power for the hoist's electrical control system.

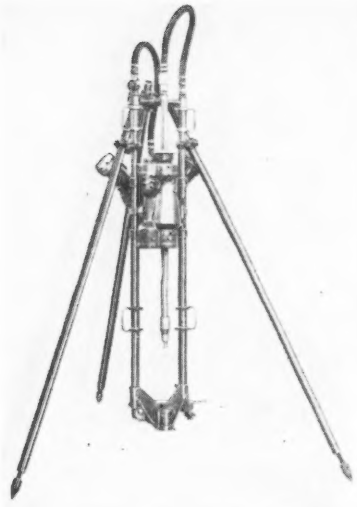


Fig. 1. Light weight drilling machine developed by Mineral Drillers, Ltd.

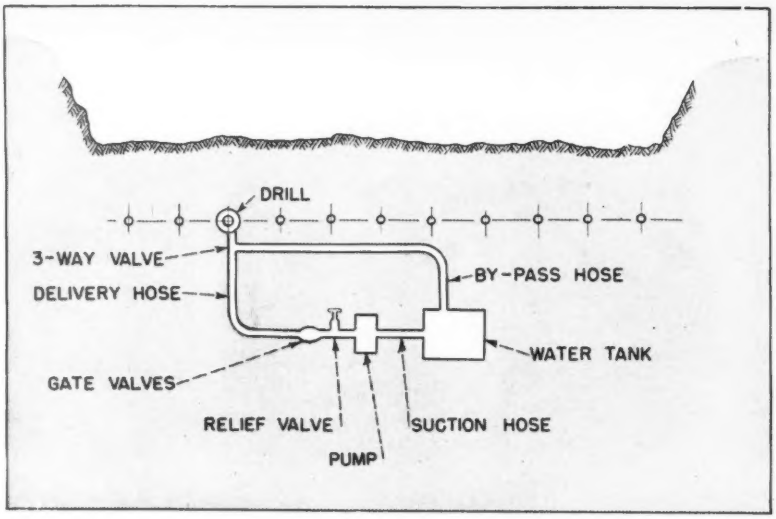


Fig. 2. Suggested arrangement of drilling components. With hoses of the correct length, only the drill and frame need to be moved for new blastholes.

Diamond Drills' Place in Pit Blasting

PATRICK ADAMSON
Wheel Trueing Tool Co.
Detroit, Mich.

DIAMOND DRILLS are not generally used in open pits and quarries throughout the United States and Canada. One successful operation in South Carolina started in 1949,[1] but small pits and quarries have continued to use churn drills and wagon drills, while larger operations have, in some cases, changed over to large rotary rigs, using Tri-cone rock bits and compressed air in place of water or mud.

In viewing the over-all picture it is obvious that every type of drilling has its place in obtaining maximum economy. However, the capital expenditure in large rotaries is a factor against their use, in some instances; and reluctance to scrap equipment and current production methods tends to retard experimentation and advance in other cases.

Diamond drilling is extensively used for quarrying in both South Africa and Australia. Techniques have been devised and equipment adapted to the special requirements of this type of work. Particularly in Australia, the need for heavy drilling machines has been overcome by applying well known methods to this specialized operation.

Mineral Drillers, Ltd., of Preston, Victoria, have developed a light weight machine (Fig. 1) that minimizes time spent in moving drills.

The drill is powered by a reciprocating air motor, and mounted on a tripod. Each side of the drill frame acts as a connection for the air and water lines respectively; and the lower end incorporates a clamp which holds the drill immovably to the standpipes, which are previously positioned and grouted, to form a row of hole collars. This method dispenses with hanging hoses on the machine, and reduces moving time.

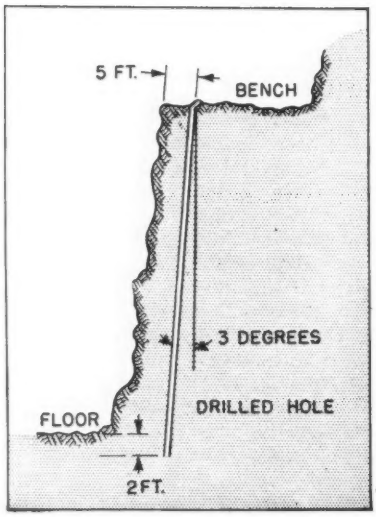


Fig. 3. Plan of bench after drilling. Two-foot extension reduces burden at toe.

Details of a typical quarry drilling operation with this type of equipment[2] are interesting when compared to similar operations by other methods. The quarry[3] is being worked at a depth of 80 ft, of which 50-60 ft is solid basalt and the remainder is overburden of clay and decomposed basalt. Previous to diamond drilling, a method of 20-ft benches, using jackhammers and 2-in. detachable bits, was employed. Barring down and secondary blasting was considerable.

As in all such cases, the quarry face was very irregular, and the first row of diamond drill holes was planned to clean the face for subsequent operations. Twenty-four XRN (1¼-in. dia) holes, with 5-ft spacing and burden, were drilled at an angle of 3 deg and extended 2 ft below the "floor." This was to reduce the burden at the toe, where it was nearer 10 ft, and to make sure it was removed cleanly at the floor level. Fig. 3 shows a cross section of the bench after drilling.

In this instance water was used from the domestic supply lines, and the air pressure was only 50 psi. Proper operation of the drill requires 100-125 psi water pressure and a minimum of 70 psi of air. Consequently, the drilling of 140 ft in one 8-hr shift was excellent, and the details given in Tables 1 and 2 show that bit costs were equally satisfactory.

TABLE 1

Holes drilled	24
Total footage	1397 ft
Average per 8-hr shift	140 ft
Average prime labor cost per ft	10.4 pence

Ed: Patrick Adamson, author of this article, is a former president of the Diamond Core Drill Manufacturers Association.

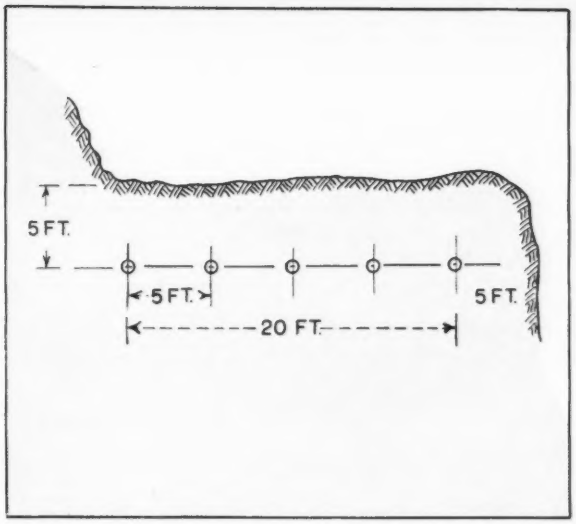


Fig. 4. Spacing of a single row of holes in a face 54 ft high. Small dia holes give efficient loading density.

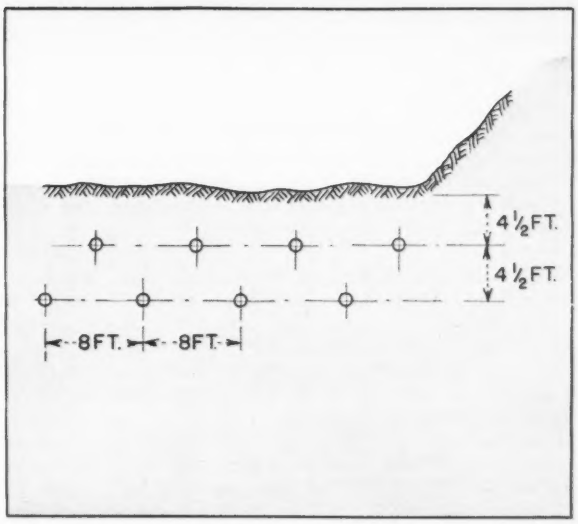


Fig. 5. Double row of holes, showing spacing. Better fragmentation, removal of toe, and economy result from this method.

TABLE 2

No. of reaming shells used	3
Average carat weight	6.33 cts.
Total Cost	63.10
Footage drilled	1397 ft
Net cost per ft after diamond salvage	4.9 pence
No. of bits used	3
Average carat weight	3.95 cts.
Total Cost	37.33.
Footage drilled	1397 ft
Net cost per ft after diamond salvage	2.8 pence

NOTE: Australian exchange is $2.25 per £A1. 1 penny Australian is a fraction under 1c U. S. Diamonds used cost $6.20 per ct. U. S.

The charging and firing of the first shot was completed with the assistance of technical service operators of Nobel (A/asia) Pty. Ltd., and this conforms with the practice in other operations[1] where it has been found that, in the initial stages, the explosives engineer is the key man to success.

Holes were loaded to within 5 ft of the collars with A.N. Gelignite "60," primed with Cortex, (Primacord), and fired electrically by means of a sequence switch at time intervals of approximately 0.025 sec. A noticeable feature was that the face was perfectly clean after the blast and half the drill hole clearly exposed over the full length of the face.

Ratio of tons broken per 1 lb of explosive was 4.5, and the total cost of all materials and labor per ton broken was 11.2 pence per ton. This was a successful operation at the first attempt.

Further details of Australian operations[4] show excellent results in quarrying solid, medium hard diorite, granite and limestones. The biggest difficulties occur when drilling in fragmented rock or where backbreak has occurred through previous drilling methods. However, when such faces are cleaned by diamond drilling subsequent backbreak is negligible,[1] and barring down is no longer necessary. Water pumps and adequate air pressures are now provided, so that present operations are far more efficient than the initial blast described above.

It has generally been found that a large number of small holes is preferable to fewer large holes. High penetration speeds, recently up to 35 ft per hr in basalt and 60 ft per hr in limestone, keep drilling time and labor costs to a minimum. Furthermore, such holes are easily controlled as to direction and the pattern can be adapted to give a flexible range of fragmentation. This reduces secondary blasting, while increasing the efficiency of the shovels and the feed rate to the primary crusher.

Improved Fragmentation

Where possible, two or more rows of holes are more economical than a single row. Better fragmentation and removal of the toe are achieved and, of course, a larger muck pile is obtained with one blast.

The proper arrangement of holes must vary according to the type of rock and the particular part of the quarry being worked (Figs. 4 and 5). Some of the factors influencing the pattern are: Tonnage required coupled with rock structure; size of primary crusher; whether blasting with, or against, the rock cleavage planes. However, the main consideration is that, regardless of other advantages, the small dia holes give the most efficient loading density with maximum effect of the explosive. Somewhat different methods have been used in South Africa[5] because of different geological and labor conditions but, predicated on the use of diamond drills, the same high ratio of economy over other methods has been maintained. When it is realized that this has run as high as 400%, it is little wonder that operators abroad have given the matter very serious attention; and have encouraged and sponsored experiments.

It is considered[5] that a 40-ft face is the minimum height at which the advantages of diamond drilling begin, and 75-ft to 100 ft is ideal. However, 250-ft faces have been drilled and blasted successfully by this method.[4]

The main difference in the techniques used in the two countries is in the size of the drill hole, which goes up to 3½-in. dia in South Africa. Fragmentation can be maintained, but a heavier drill is required, with increased cost of ancillary equipment, and particularly of diamond bits and reaming shells. Moreover, it has not been the experience of drillers in the United States that solid bits over 'NX' size can compare in efficiency with 'AX' or smaller.

The theory behind the larger holes[5] is of interest. On the first blast an arbitrary ratio of 4 tons of rock thrown per 1 lb of powder is used. Assuming the material is limestone, weighing 143 lb per cu ft (i.e., 14 cu ft per short ton), then the 3½-in. hole is loaded with 60% strength explosive of 22x3⅛-in. dia, which weighs 3.8 lb per ft. Burden and spacing are then calculated so that the tonnage per ft is 3.8x4 = 15.2 tons. This is equivalent to 212.8 cu ft (15.2 x14) and means that a burden of say, 13 ft, requires spacing of $\frac{212.8}{13} = 16.4$ ft approximately. Spacing is generally greater than the burden of the holes, and both are increased with experi-

ence up to a point where secondary blasting is somewhat below 5% of the total break. This is the point of maximum economy.

Formations successfully quarried in South Africa include quartzite, limestone, serpentine (open-pit asbestos mining) and shales. Costs per ton on the quarry floor naturally vary, but in all cases are much below alternative methods.

Apart from the differences in machines and equipment, formations drilled, and labor rates, techniques developed show a remarkable similarity. Of course, millisecond delay blasting is common to both and is the key to successful operation. Although this subject has been thoroughly explored[6], a simple explanation may be helpful to those who have not had occasion to use it.

An "instantaneous blast" is a relative term because the velocity of detonating fuse is approximately 20,000 fps, and so between blast holes 5 ft apart there is a delay of .0004 sec, or .4 of a millisecond. The delay is so small that, although the blast is not strictly instantaneous, the rock under stress in the first of a row of holes is hardly beginning to fracture before the last hole is fired. By prolonging the delay to, say, .025 sec between holes, each successive hole has two free faces to break to, and the explosive action of the powder in the first hole is fully developed as the next hole fires. The effect of this is that the shock waves interact and, while cancelling out one another to some extent, cause a turbulent action that improves fragmentation, but reduces vibration. This is highly important in many mining operations, and in quarrying where buildings are adjacent. The throw of rock is generally less than half that of an instantaneous blast, and this is an important safety factor, apart from reducing the handling and haulage costs.

The terrain surrounding a quarry is often rough, and diamond drills have a distinct advantage here, for they can be easily moved. In the case of the Australian drill, two men can carry it; and with heavier type drills a deflecting sheave and use of the hoisting rope,snubbed to a suitable anchor, allows them to move along the row of holes under their own power without extra delays.

A storage tank for water is advocated and a typical arrangement is shown in Fig. 2.

Where standpipes are grouted into the rock, half moons are welded to the bottom ends to key them into position. The holes are drilled with jackhammers and star bits of suitable size, and care is taken to have the cement firmly set well ahead of the drilling sequence.

All operators stress the need of a careful preliminary survey, and all take advantage of the factors peculiar to diamond drilling, such as a smooth borehole of equal dia from top to bottom; ease of loading; directional control; drilling parallel to a sloping face when required; ease of moving; low initial investment; reduction in labor cost and a smoother, more accelerated operation.

The advantages of the method have now been demonstrated for a period of several years and over widely varying areas. While it is not the answer to all conditions, it is certainly applicable to the majority, where careful planning and preparation would ensure success.

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New Metallurgical Process May Unlock Refractory Ore

GEORGE H. CLEAVER
Assistant Markets Editor

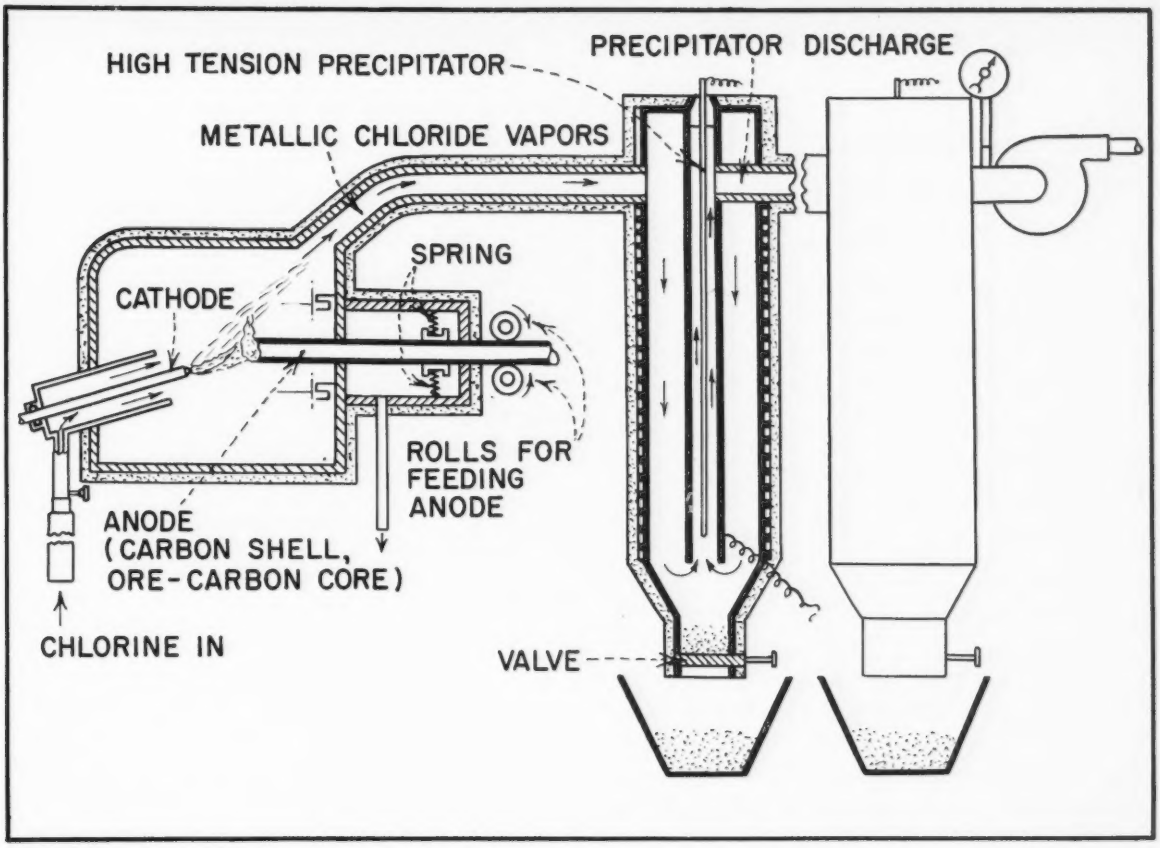
USING A HIGH INTENSITY ARC and an anode made up of carbon and the ore charge, a new process patented by Doctors Charles Sheer and Samuel Korman of Light Metals Refining Corp. (New York) may provide a commercial method of reducing refractory ores which are difficult to reduce by conventional smelting methods. These include ores of aluminum, magnesium, beryllium, manganese, tungsten, molybdenum, titanium, vanadium, zirconium, tantalum and silicon.

In practice, the anode consists of a core of a carbon and ore mixture in a graphite or carbon shell. Mixture of ore and carbon in the core may be varied but satisfactory results have been obtained with 85% ore and 15% carbon. The cathode may be of solid carbon or neutral soft cored carbon.

In the high intensity arc, the temperature is estimated to be between 15,000 and 20,000 deg F. At that temperature the entire anode is vaporized at great speeds, resulting in a superheated region of extremely brilliant gases immediately before the anode face. There is also an emission of a high velocity (about 100 mph) jet of brilliantly luminous highly ionized vapor which shoots out of the path of the current stream extending as much as 2 ft from the anode although electrode spacing may be only one inch.

An effect of the high tension arc is the erosion of the anode. As it is vaporized, more anode is fed continuously into the furnace to maintain proper electrode spacing. As the cathode does not waste away rapidly, no special feeding means for the cathode is provided.

Chlorine is fed into the furnace, which mingles with the vapor jet and combines with the metallic constituents as the vapor cools, converting them to chlorides. Chloride vapors are piped to a series of condensing chambers where each of the chlorides is successively condensed in pure form. The final step is electrolysis of the chloride.



HIGH INTENSITY ARC vaporizes anode composed of ore and carbon at temperatures up to 20,000 deg F. Chlorine introduced into furnace combines with vapor and forms metallic chlorides in cooling which are recovered separately in condensers.

The high intensity arc (so named because of the high intensity of illumination that results from it) is an entirely different electrical phenomenon from the common arc. It occurs as a sudden transition from the common arc when the current densities at the anode exceed a critical value. The critical point is easily recognized by marked changes in appearance of the arc and in its properties. In addition to the big jump in temperature (3600 deg C for the normal arc), the appearance of luminous vapor, and the sharp rise in the rate of erosion of the anode, there is also a distinct change in the volt-ampere curve. The high intensity arc acts like a normal resistance, requiring additional voltage to send more current. In the normal arc, an increase in current is accompanied by a decrease in voltage across the arc.

Current Requirements

Amount of current required to produce the high intensity arc is dependent on the size of electrodes used. Current does *not* increase in proportion to the increase in cross sectional areas of the anode, since small electrodes require a much higher current density than large ones as shown in the accompanying table.

Anode diameter	Current required	Current per mm²
8.5 mm	80	1.41
11.0 mm	90	.94
16.0 mm	100	.49

Here are statistics on a typical laboratory example of reducing aluminum from clay at reduced pressure with this process.

Length of arc: 4 in.
Diameter of anode: ⅜ in.
Voltage across electrodes; 180 v
Current through arc: 8 amp
Gas pressure: 7 cms

Under these conditions, a series of tests showed an ore reduction of 42% at a power consumption of 50 kwh per pound of metal produced.

In the pilot plant stage at one time was a plant using this high intensity arc process for the reduction of beryllium. According to Dr. Sheer, the price of beryllium by the new process would be about $15 per lb. More important, is the fact that by this process beryllium 99.6% pure can be obtained. This can be more easily machined and fabricated than the less pure metal now used. Dr. Sheer said that this may reduce machining and fabricating costs by one third.

By conventional methods, at present prices an ore with a minimum of 8% BeO is required to make the metal. With the new process, Dr. Sheer thinks that ore containing 1% or 2% could probably be used. The lower the grade of ore, the greater the by-products to be recovered. (The estimated production price of $15 is based on 8% BeO.)

Dr. Sheer said he had had the unit producing beryllium chloride at a rate equal to about 3000 or 4000 lb per year. Optimum size unit would probably be about 10,000 lb per year. Increasing plant capacity would mean installation of more units. The company plans on putting up one such unit soon.

Work on laboratory scale has been proceeding on titanium production. The major problem, which has just about been solved, has been the handling of contaminants.

Dr. Sheer disclosed that about three years ago he tried the process in producing silica fume. It is now being used by a major chemical company for that purpose.

OPERATING IDEAS

Rapid Graphic Solution of Air Friction Loss

DR. HOWARD L. HARTMAN
University of Minnesota

IN MINE VENTILATION WORK, no calculation is performed more frequently or ardously than the one for static pressure drop of airflow through mine openings. The fundamental friction loss formula which must be employed is usually expressed

$$h = \frac{KPLV^2}{5.2A}$$

where **h**: air static pressure drop, in. water,
P: airway perimeter, ft,
L: airway length, ft,
A: airway area, sq ft,
V: air velocity, ft per min,
K: friction factor

Charts are available which permit a graphical determination of pressure drop when ventilation piping or tubing is employed. However, these charts are not satisfactory when the general problem of airflow in mine openings is faced because of non-circularity of the airways and variances in friction factor.

A nomograph is presented here that overcomes these difficulties in solving the fundamental formula for airways of any shape or friction faction. If hydraulic radius, y, which equals area divided by perimeter, is substituted in the fundamental formula, the equation becomes

$$h = \frac{KLV^2}{5.2y}$$

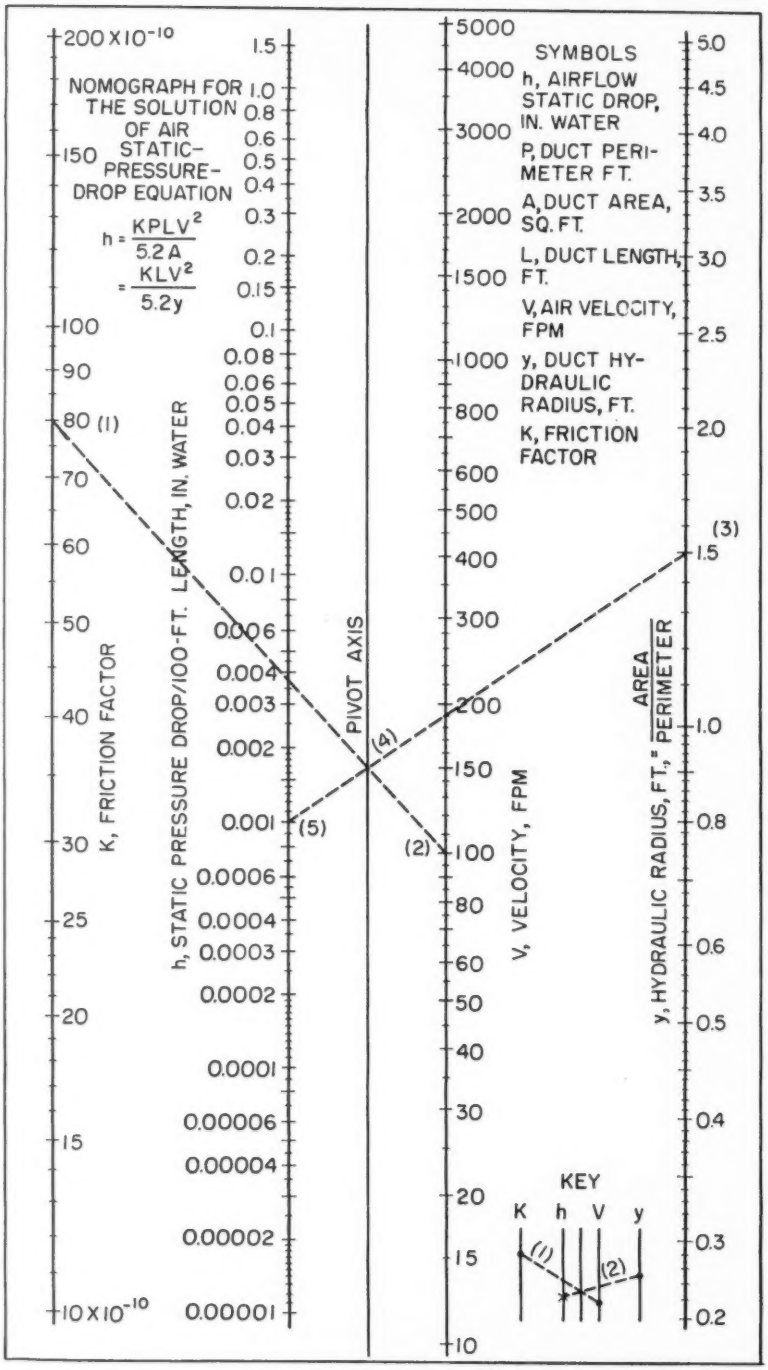
This revised formula is the basis for the accompanying graph.

In using the pressure drop nomograph when the airflow and airway characteristics are known, hydraulic radius is first computed or read from the table below and the friction factor is selected from experience or a table.[1] These values are connected by straightedge on the nomograph, following the procedure outlined in the key. The static drop is then read directly in in. water, per 100-ft length of airway.

The accuracy obtained with this nomograph (1 or 2%) warrants its use in all routine ventilation work and as a check for precise survey measurements and calculations.

Nomograph copyrighted by Howard L. Hartman under registration number Iu 8547.

[1] McElroy, G. E., Engineering factors in the ventilation of metal mines, USBM Bull. 385, p 43, 1935.



How To Use Nomograph

Given the following: K = 80 x 10^{-10}; V = 100 fpm; y = 1.5; L = 3000 ft. Determine h, drop per 100 ft in inches of water.

Procedure:

(1) Place rule on 80 on the K scale at left.
(2) Also on 100 on the V scale at right center, and draw line intersecting pivot axis, center.
(3) Place rule on 1.5 on the y scale at right.
(4) Also on pivot axis, center, and draw line to intersect h scale, left of center.
(5) Read answer .00103 at final point of intersection.

Table for the Determination of Hydraulic Radius = Area / Perimeter

DIMENSIONS*	1	2	3	4	5	6	7	8	9	10	11	12	15	20	25	30
circular	.25	.50	.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.75	5.00	6.25	7.50
1	.25	.33	.38	.40	.42	.43	.44	.44	.45	.45	.46	.46	.47	.48	.48	.48
2		.50	.60	.67	.71	.75	.78	.80	.82	.83	.85	.86	.88	.91	.93	.94
3			.75	.86	.94	1.00	1.05	1.09	1.12	1.15	1.18	1.20	1.25	1.30	1.34	1.36
4				1.00	1.11	1.20	1.27	1.33	1.38	1.43	1.47	1.50	1.58	1.67	1.72	1.76
5					1.25	1.36	1.46	1.54	1.61	1.67	1.72	1.76	1.88	2.00	2.08	2.14
6						1.50	1.62	1.71	1.80	1.88	1.94	2.00	2.14	2.31	2.42	2.40
7							1.75	1.87	1.97	2.08	2.14	2.21	2.39	2.59	2.74	2.84
8								2.00	2.12	2.22	2.31	2.40	2.61	2.86	3.03	3.16
9									2.25	2.37	2.48	2.57	2.81	3.10	3.31	3.46
10										2.50	2.62	2.73	3.00	3.33	3.57	3.75
11											2.75	2.87	3.17	3.55	3.96	4.02
12												3.00	3.33	3.75	4.06	4.29
15													3.75	4.29	4.69	5.00
20														5.00	5.56	6.00
25															6.25	6.81
30																7.50

(Prepared to accompany nomograph used for solution of static pressure drop equation in mine ventilation)

$$h = \frac{KPLV^2}{5.2A} = \frac{KLV^2}{5.2y}$$

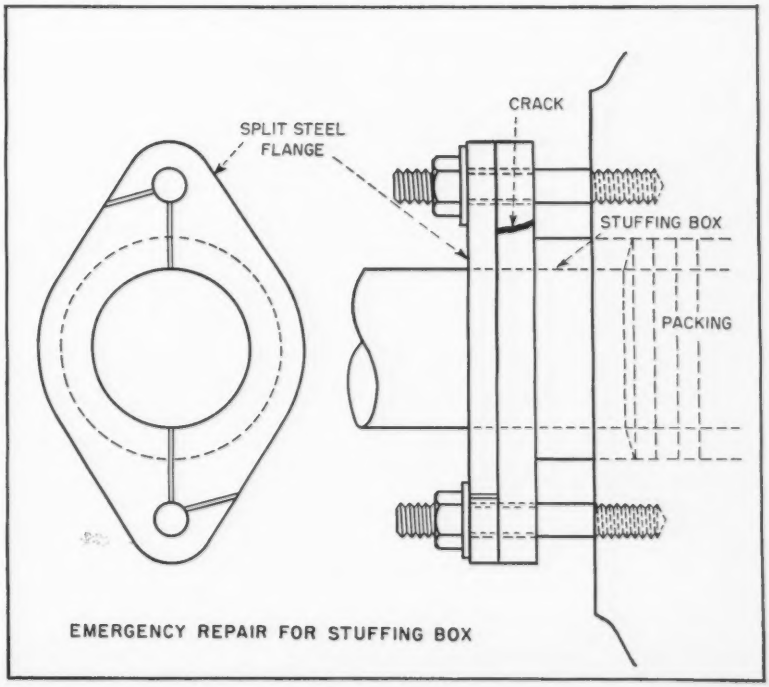
where: h, airflow static drop, in. water
P, duct perimeter, ft.
A, duct area, sq. ft.
L, duct length, ft.
V, air velocity, fpm
y, duct hydraulic radius, ft., = A/P
K, friction factor

* In Feet

TABLE ABOVE pertains to text and nomograph on opposite page

Emergency Repair for Compressor

THIS SIMPLE AND EFFECTIVE temporary repair to damaged compressor stuffing box is submitted from a western lead-zinc mine. The maintenance man, while taking up the compressor packing to stop leakage, accidentally cracked the stuffing-box flange, and with no spare parts available, eventual shutdown of the compressor was a possibility. This was avoided by making the split-steel flange shown. To assemble it on top of the cracked flange, one half is laid on first and then the other half slipped into it. The two halves are thus locked and cannot be pulled apart sideways, and the piston rod prevents their being moved lengthwise. The split design also prevents half of the flange from dropping out if the nuts should loosen a little under vibration.



EMERGENCY REPAIR FOR STUFFING BOX

German Tungsten

(Continued from p 93)

limited pressure (for drilling upward as well as downward and forward) will help reduce the drilling time and improve operating economy. The base of the hammer should not be more than 1.8 to 2m below the hammer axis for drills driving drifts.

Working life of the equipment can be increased if one succeeds in reducing the bending stress superimposed on the tractive-compressive stress. This can be achieved by displacing the point of application of the hammer support into the hammer axis, preferably in the center of gravity.[4] *(See footnote 4, p 93)*

This knowledge led to the development of new German drill tools. For example, the Krupp "Suprham" hammer drill introduced in 1951 has a cylinder dia of 78 mm, a stroke of 40 mm, and a weight of 20 kg. In comparison with the older models, this unit provides increased cylinder diameter, and shorter stroke. Striking rate at 5 atmospheres is about 3000 blows per min. In Fig. 4 you can see the drill. Note particularly that the unit is supported by a fork attached to the center of gravity of the drill hammer. The telescopic feed leg, also supplied by Krupp, has a greater extensible length, but shorter over-all length when contracted—both features being desirable to cut down drilling costs as discussed previously. Drilling tools of similar design are supplied by Demag and Flottman.

Letters

(Continued from p 4)

Union of South Africa) has had some article . . . emphasizing the importance of private investment aboard . . . as opposed to a regime of public grants . . . to friendly nations which are having a hard time making ends meet.

. . . What are the real prospects (for investments outside the western hemisphere,) which most investors feel . . . are so great as to be almost prohibitive? Along with a very few other countries, . . . I feel that the Union of South Africa is a notable exception.

(She) is about as remote from areas of possible conflict as one can get. Her sea lanes would be among the easier ones to keep open in the event of another World War. South Africa is one of the better American markets and a storehouse for essential materials like manganese, chrome, asbestos, copper, tin, lead, nickel, corundum, beryl, platinum, antimony and now uranium.

I think it is plain that trade between the U.S. and South Africa is natural and complementary, and inevitably will grow . . . our relations are expanding rapidly against a background of common interest and purpose. To fulfill its great promise (of great expansion) South Africa needs more outside capital. It will be to our national interest to support South Africa's economic development to the fullest and greatly add to our already extensive (stake there).

There are no restrictions either on the remittance of earnings or the repatriation of capital.

I believe that South Africa has gotten a bad press. There is not a single American press correspondent in all of South Africa. The sole means of disseminating news of South African affairs is through British press channels. The present National government, which is primarily concerned with the political advancement of South Africa as contrasted with the pro-British bias of its predecessor, is understandably unpopular with the British press.

News reports would have us believe that the South African government is grossly oppressing the Negro majority in South Africa and that the country is on the verge of revolution. To those of us who know South Africa, this all sounds rather silly. The truth is that the South African Negro, or native, as he is called, has made more cultural and economic progress in this post-war period, coincidental with the upsurge in industrialization, than in several previous decades combined, and he is fully aware of it.

Politically, he is severely, and probably unwisely, circumscribed—but this in my opinion is only a passing phase in South Africa's evolution . . . Beyond the inevitable, if isolated, instances in which the resentment of black against white is fanned by troublemakers, the progress of the South African Negro is likely to proceed along evolutionary rather than revolutionary lines.

. . . The balance of power (between the dominant National party and the pro-British United party) is a delicate one. To achieve its dream of a republic (to which all South Africans will owe full and equal allegiance) the National party has known that it must increase its electoral majority . . . This desire for a republic is also at the root of much of South Africa's restrictive "apartheid" legislation. Mistakenly or not, the Afrikaaner doesn't want the native to move too fast until the republic is achieved and the tutelage of the African can proceed in an orderly way.

. . . I predict that South Africa will become a republic within less than five years, and possibly within two.

What will be the status of a foreign investor under the republic? I would say it will continue highly favorable, and quite probably will improve. . . . I expect the advent of a republic in South Africa to create tremendous new interest in the area on the part of American investors.

I will not deny that South Africa must face up to serious economic, social and political problems in the years to come, (but) I have confidence that (its) leaders will . . . find . . . solutions . . . and that peaceful evolution, not revolution, will prevail.

H. WALTER BOESCH
Battle Creek, Mich.

Tin Editorial

SIR:

We in this country were very impressed by the editorial (*E&MJ*, March 1954). We have reproduced this in *Tin*, as we feel it is of particular interest to tin producers throughout the world.

RICHARD TEMPLE, *Chairman*
Publications Committee,
Tin Producers' Assn., Inc.
London, S.W. 1, England

Drills for Glass

SIR:

You published (in Operating Ideas, Vol. 154, No. 11, p 101) "An Easy Way to Drill Glass." Whilst the methods prescribed are quite suitable, the time required is (great, particularly with thick glass). . . . The industry prefers the use of diamond drills (in one of the following four types).

(1) . . . To drill only one or two holes of one particular size, . . . thin-walled copper (or brass) tubing . . . with a sharpened edge (and 80 or 120 mesh diamond dust suspended in light oil) is recommended. This is . . . much quicker than the recommended carborundum powder.

(2) (For) a larger number of holes . . . copper or brass tubing . . . the edge of which is slotted . . . and diamond grain of 80 to 120 mesh lightly hammered in . . . can be used with a supply of water and (a number of holes drilled economically).

(3) When . . . 20 or more holes of the same size (are required) commercially available diamond drills (are) recommended. . . . Diamond drills with a sintered metal rim . . . are very efficient tools.

(4) There are thin-walled electrolytic diamond drills, from 1/16-in. to 2-in. dia, which many workers have found to be most economical.

P. GRODZINSKI
Industrial Distributors Ltd.
London, England

ESP and Water Drilling

SIR:

Speaking of extrasensory perception (*E&MJ*, March 1954, p 4), water is the life blood of mining as well as farming. Kenneth Roberts, author of "Henry Gross and his Dowsing Rod," says we are not making the best use of our underground water resources; that we are only using the motionless underground water . . . but not (that) from greater depths.

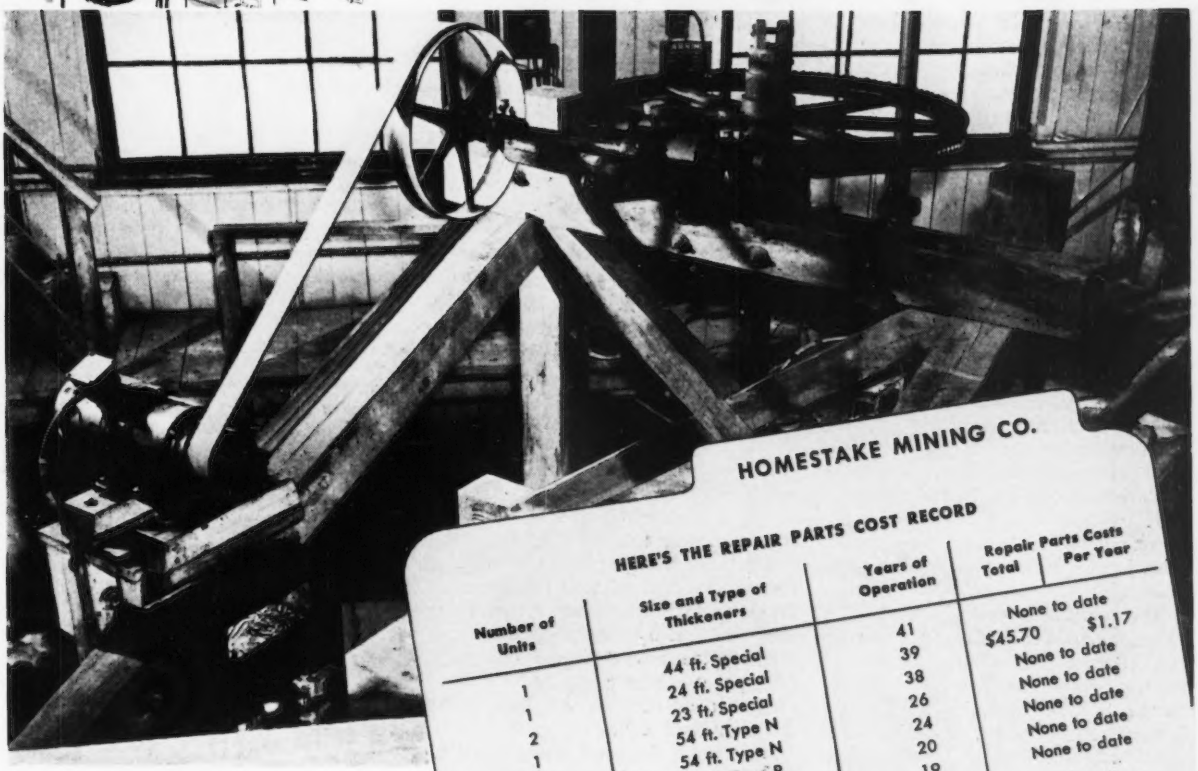
Many springs have a deep seated origin (both hot and cold) and may be a great source of water. The principal problem is how to spot the right place to drill.

WILLIAM CROCKER
Prescott, Ariz.

Let's have your comments too! Your reactions to articles and features appearing in E&MJ will be welcomed. Address your letters to The Editor, Engineering and Mining Journal, 330 West 42nd Street, New York 36, N. Y.

AT HOMESTAKE MINING COMPANY

Eight Dorr Thickeners in slimes circuit average 21 cents per unit per year for repair parts cost.



Closeup of drive mechanism of one of the eight Dorr Thickeners in the Homestake slimes circuit. This particular 24' diameter unit has been operating since 1914.

HOMESTAKE MINING CO.

HERE'S THE REPAIR PARTS COST RECORD

Number of Units	Size and Type of Thickeners	Years of Operation	Repair Parts Costs Total	Repair Parts Costs Per Year
1	44 ft. Special	41	None to date	
1	24 ft. Special	39	$45.70	$1.17
2	23 ft. Special	38	None to date	
1	54 ft. Type N	26	None to date	
1	54 ft. Type N	24	None to date	
1	54 ft. Type R	20	None to date	
1	60 ft. Type R	19		

In the period 1911 to 1933, Homestake ordered eight Dorr unit-compartment Thickeners of varying types and sizes for slimes thickening. As shown in the table above, the maintenance record of these units is adequate testimony that they were built to last.

Light duty in the slimes circuit — sure. We'll also have to admit to remarkably careful and efficient operation on the part of Homestake over the years. But bear in mind that these are light machines — built for light duty — and are still going strong after 16 to 38 years of continuous operation.

We wouldn't suggest that you can expect "no repair" performance on every Dorr Thickener regardless of type of duty. Point is, though, when you buy Dorr you buy minimum repairs. More important still, you buy minimum shut-down time and maximum production. The Dorr Company, Stamford, Conn., or *in Canada*, The Dorr Company, 26 St. Clair Avenue East, Toronto 5.

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WASHINGTON IMPACT

Morton A. Reichek, McGraw-Hill Washington News Bureau

Bills Would Liberalize Miners' Use of Public Lands; Metal Markets Confused By Stockpile Price Change

PROBABLY THE MOST IMPORTANT change ever made in the traditional mining laws may be enacted this month. It would open up for "hard" mineral entry at least 50-million acres of Public Lands now reserved or leased for oil and gas operations.

Under the proposed revision, claims for uranium and other metals could be staked on lands withdrawn for leasing. It would allow mining and oil-gas leasing on the same tract of public land. Whether or not the land is leased or could be leased for oil and gas operations, a miner would be able to locate, file, and work a claim, then get a patent. But he would have no right before or after the patent to the oil, gas, coal, phosphate, or other leasable minerals on the tract of land. Title to these would remain with the Government. Up to now, of course, a mine locator contemplates nothing less than full title.

The revision is designed mainly to spur uranium prospecting in Colorado and Utah. At presstime, the Senate Interior Committee has favorably reported S. 3344 (Mining Claims on Leasing Act Lands), covering this significant mining-law revision. A companion bill, H.R. 8896, had been favorably reported by the House Mines & Mining Subcommittee and then favorably reported out by the full House Interior Committee. The bills were expected to get through Congress without a hitch.

Last year, a similar law was passed, clarifying the status of mining claims in areas held under an oil and gas prospecting permit or lease. But this was limited to claims made between July 1, 1939, when vanadium-uranium development for defense purposes started on the Colorado Plateau, and Jan. 1, 1953, which was just before the legislative proposal was made. As the mining laws now stand, a miner on oil-gas lands after the latter date is in trespass.

Stockpile Confusion

The Administration's new stockpile policy, announced in March, increased metal stockpile goals and supposedly called for accelerated buying to help bolster sagging metal prices. But last month, when ODM finally got the ball rolling, mining men began to wonder whether the program would unwittingly break prices instead.

Explaining why the Administration took so long to get the new stockpile program under way, one official has said that "there was no need to step off into deep water." As it turned out, GSA found the water hot rather than deep.

GSA was instructed to buy lead at under 14c, zinc at under 13c. At the time, lead was at 14¼c, zinc at 11c. A few days after the directive's announcement, GSA invited tenders for both lead and zinc, withholding the ceiling prices imposed by ODM. So, much to industry's dismay, some offers of zinc were accepted at the market price—being below ODM's ceiling—while lead offers at 14¼c were rejected. Later, lead offers at 14c were turned down, too.

Outraged lead producers demanded an explanation. GSA's action was breaking the market, not supporting it, they charged. By the end of the week, ODM unhappily disclosed the price ceiling that had been imposed on GSA, then revoked it. GSA was then given the green light to buy lead at the going market price. But still unexplained is why GSA invited tenders when the market was higher than the price at which it was authorized to buy—in effect, the support price.

According to some observers, the episode on lead demonstrates that if the Administration actually intends to support lead prices—and other metals—it should announce a guaranteed minimum price that the stockpile will pay. But the rub is that Government officials dislike to talk about the new stockpile policy as an outright price support program. Instead they say the policy is really a defense measure and imply that any benefits that accrue to metal markets are only corollary.

Aside from last month's lead and zinc purchases, details on the new stockpile policy are still unknown. Last month's purchase directive eventually provided for purchases at the market price and was restricted to newly mined domestic metal. But there is no assurance that these practices will be followed in future purchase directives.

Several weeks ago, W. Lunsford Long, of the Tungsten Mining Corp., Henderson, N. C., and Charles H. Segerstrom, Jr., of the Nevada-Massachusetts Co., which has a mine at Tungsten, Nev., president and vice president, respectively, of the Tungsten Institute, were in Washington to learn how the new stockpile policy will affect tungsten producers. They were specifically interested to know whether the domestic purchase program will be extended again under the policy's provisions. They learned nothing.

Texas City Smelter Survives

The Congressional decision to keep the Government's $11-million Texas City Tin Smelter operating for another year was unforeseen as recently as 90 days ago. It had been assumed that the Administration's plan to close the smelter June 30 would be approved by Congress only after nominal opposition, mainly from Texas Congressmen.

The Administration's view was that there was no longer any justification for operating a high-cost tin smelter. Officials told Congress the tin stockpile was brimming over with more than enough for at least six years of U.S. consumption. A smaller and more efficient U.S. smelter could be built within 18 months in case of a future emergency.

But then came the fall of Dienbienphu. The new Indo-China crisis bolstered the stand of those who had been advocating the smelter's continuation to insure a safe domestic source for tin. They had contended that the U.S. could not depend on Southeast Asian tin because of that region's vulnerability to Communist attack. The Viet Minh triumph at Dienbienphu dramatized this argument.

Congress then voted a resolution by Sen. Lyndon Johnson (D., Tex.), the Senate minority leader, and Rep. Clark Thompson (D., Tex.), in whose district the tin plant is located, to keep the smelter operating until June 1955. The resolution also provides for a Congressional investigation to determine whether the smelter should then be leased or sold to a private firm or should continue to be operated by the Government.

Prior to the resolution's passage, some officials proposed a compromise

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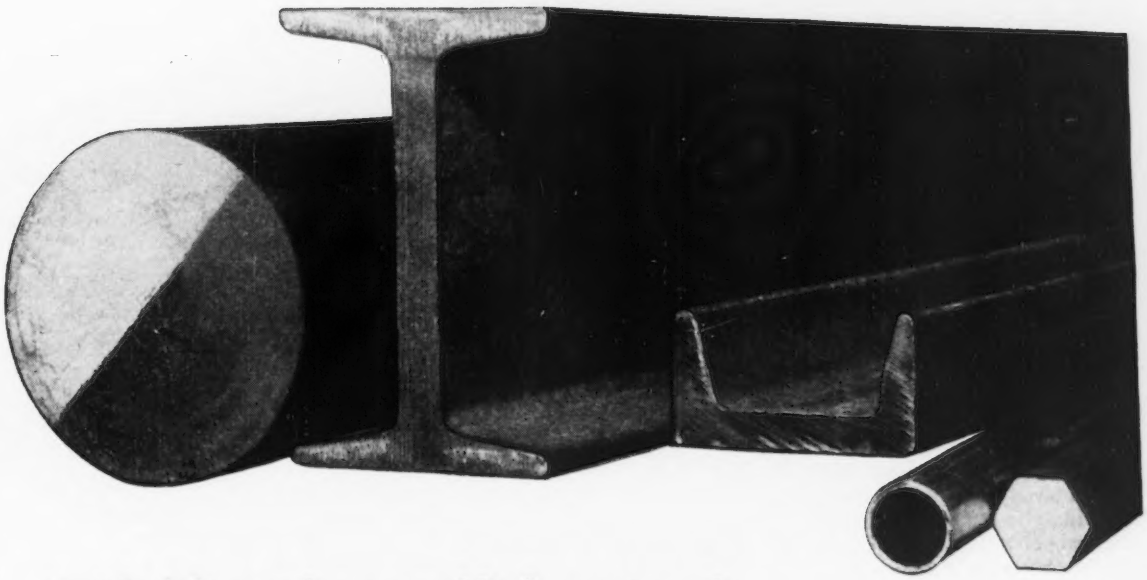

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—that the smelter be kept on standby. This was quickly turned aside when it was pointed out that mothballing expenses for two or three years would exceed the cost of rebuilding the facilities that could be actually kept on standby.

Washington now hears rumors that (1) a syndicate representing the Bolivian Government and private U.S. capital has made overtures for purchase or lease of the smelter, and (2) a large zinc producer, an aluminum company and others, are interested.

Emergency Controls?

The Indo-China crisis has rekindled thinking about Government controls on industry. In particular, it has led to considerable conjecture that the Administration will seek standby authority for a 90-day freeze on prices and wages before Congress adjourns.

The Administration now has priority and allocation authority on materials, which is exercised to a limited degree by the Commerce Department to facilitate procurement of metals and equipment by military and Atomic Energy contractors. Since so few materials are short, however, the authority almost is academic and has put the squeeze on very few non-defense consumers.

But the Government has no direct control authority on prices and wages. Last year, Congress voted down a proposal to grant the President standby power to freeze prices and wages, mainly because of the Administration's own disinterest.

Despite the Indo-China crisis—and the speculation it has bred about new controls—the Administration still doesn't seek price-wage freeze power. According to some experts, the President would request such standby authority only when and if he should find it necessary to call for a new military buildup of at least $5-billion. As this was written, Administration leaders were playing down such a possibility.

As related to mining, the material priority and allocation provisions now in the law involve GSA's standby authority—inherited from the now-defunct DMPA—to allocate ores and concentrates and to grant priority for procurement of mining equipment. Early this month, ODM was to transfer this over from GSA to the Interior Department.

Assuming U.S. intervention in Indo-China, when would Government controls on prices, wages, and materials be applied? Under present business levels, most officials feel the economy could absorb up to $10-billion of new defense spending without much inflationary pressure on prices.

LABOR THIS MONTH

Alan E. Adams, McGraw-Hill Washington News Bureau

MINE-MILL THREATENS WAR: Stalled negotiations with the big four nonferrous metals companies brought a strike threat by the Mine-Mill & Smelter Workers Union. Delegates to the super-special MMSW bargaining and legislative conference in the nation's capital late last month, piqued at failure to elicit a wage offer in six weeks of bargaining, demanded a strike vote throughout the union. However, the demand was viewed as a bargaining tactic. Mine-Mill members are more concerned about layoffs in the industry than winning anything close to the 25 cent-an-hour demand by union officials. Strike talk is discounted; a moderate wage increase is more likely to answer the 1954 negotiations.

Mine-Mill members buttonholed Congressmen and Government leaders to promote the union's economic and legislative programs, but most of the arguments fell on deaf ears. The delegates struck out with their protests against "anti-labor" legislation and demands for higher tax exemptions among low income groups.

NLRB SCORES INITIAL VICTORY: After losing a series of court tests against left-wing unions, the Government's labor agency followed through on the conviction of Communist labor leader, Ben Gold of the Fur & Leather Workers Union. The Labor Board barred Gold's union from Board services, leaving it wide open for invasion by other unions seeking to win plant bargaining rights from the fur workers organization. This is the first time an international union has been hit by such an order.

The Board is attempting a similar move against Mine-Mill but so far without success. Extensive NLRB hearings designed to show that MMSW secretary-treasurer Maurice Travis signed a false anti-Communist oath bogged down when NLRB agents failed to show Mine-Mill members were aware of Travis' political sentiments. At presstime, the fight was still on but the Board was losing. Travis is specifically charged with affirming his Communist connections in the Mine-Mill paper, shortly after signing the Taft-Hartley non-Communist oath back in 1949.

MAJOR UNION SPLIT IN FIGHT ON REDS: The CIO and AFL, both strongly anti-Communist, have adopted two different methods against Communist infiltration:

- CIO Auto Workers, led by CIO Chieftain Walter Reuther, are demanding proof of members' left-wing associations. When UAW members attacked fellow workers who invoked the Fifth Amendment in testifying before Congressional committees, the union sided with the victims. UAW policy is to give suspected Communists the benefit of the doubt until the charges are proved. If they are, the members will be expelled from the union.

- AFL President George Meany, on the other hand, wants no truck with left-wingers. When the AFL Meat Cutters sought to take over Gold's fur union, Meany gave the amalgamation a cool reception. "You can't do business with them under their present leadership," he snapped.

GE KEY TO RED WORKER MENACE: General Electric Co. plants are the sites for a last-ditch fight by suspected Communist officials. If they are ousted, the action may groundswell to include all other left-wing union activities. Two factors are vital:

- Move by the CIO Electrical Workers to take over bargaining at the defense-producing GE Schenectady, N.Y., plant where a left-wing independent electrical union has been in power. Move was inspired by workers seeking to get out from under the thumb of the incumbent union.

- Promised investigation by Wisconsin's Senator McCarthy who claims the nation's defense works have been infiltrated by at least 135 Communist sympathizers. Many of them reportedly are located at GE establishments.

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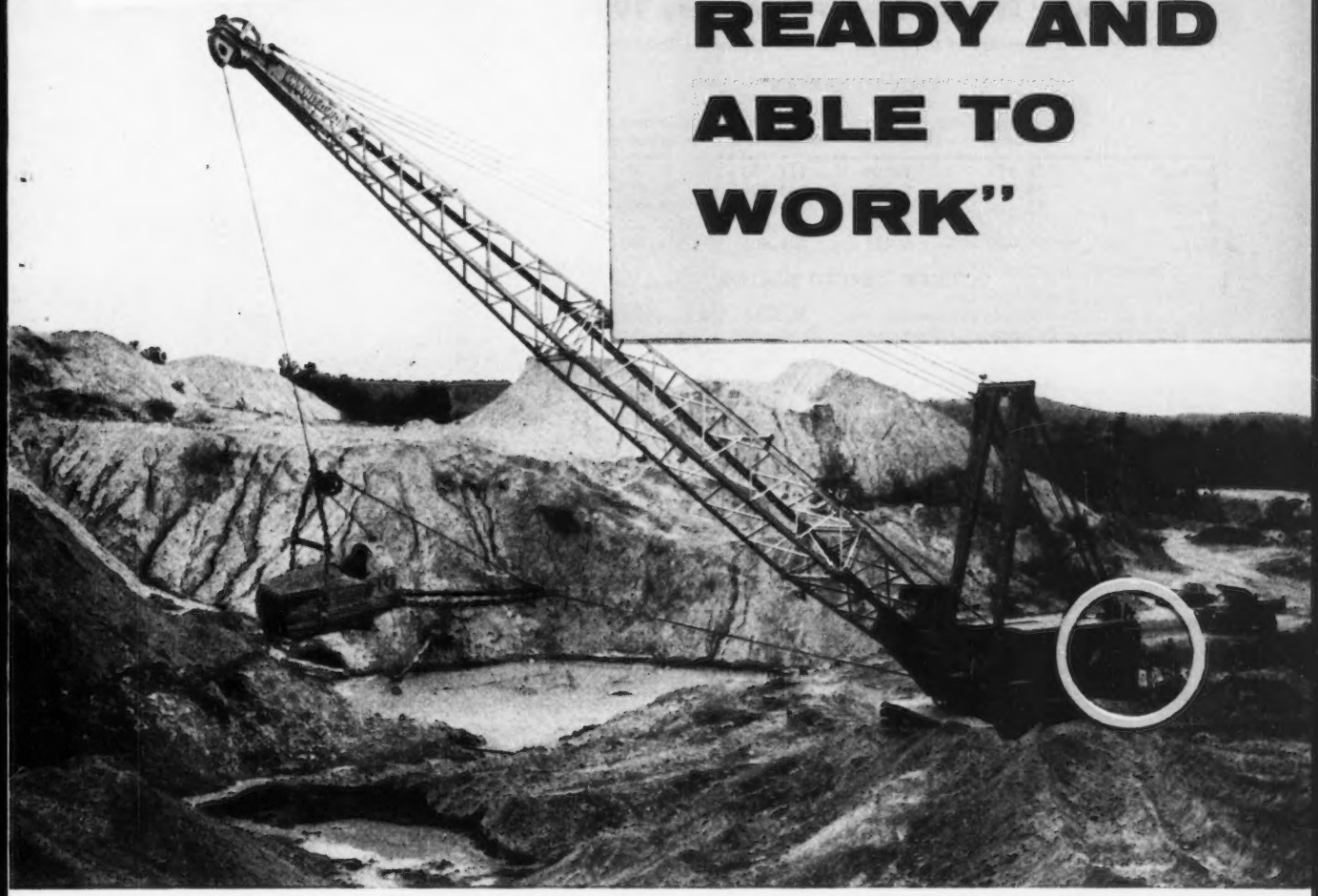

More than five years ago, U. S. Pipe and Foundry Co. purchased its first Cat Engine to power a Manitowoc model 300 dragline. Its performance was so impressive that the company now has three more Caterpillar Diesels in draglines, plus two No. 12 Motor Graders and two D7 Tractors with bulldozers.

The original D13000 has more than 11,600 high-production hours to its credit. The dragline pictured here, a Manitowoc 4500, is powered by a big, 400-HP Cat D386. The company's four draglines account for nearly all of its production of 150,000 tons of iron limonite ore annually at this plant at Russellville, Ala.

Long work life is one reason for this company's satisfaction. Such features as specially hardened crankshaft journals, long-lived aluminum alloy bearings, and really *effective* engine filters and seals give Caterpillar Engines many years of high production with low down time. Fuel economy is another cause for owner satisfaction: all Caterpillar Diesels are built to deliver full power, and idle without fouling, on low-cost No. 2 furnace oil, thanks to their exclusive, Caterpillar-built fuel injection systems.

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 (Continued from page 69)

Copper Statistics — January-May 1954

FOLLOWING is a summary of the copper statistics of Copper Institute, in tons:

UNITED STATES

	Crude Production—Primary	Crude Production—Secondary	Refined Production	Deliveries to Fabricators	Stocks Refined at End
January	76,912	7,304	111,553	77,091	108,121
February	68,034	6,394	103,496	89,017	118,417
March	73,429	7,671	117,546	95,795	125,759
April	70,977	6,486	112,617	104,579	124,523
May	71,459	6,717	108,403	111,005	82,111

OUTSIDE UNITED STATES

	Crude Production—Primary	Crude Production—Secondary	Refined Production	Deliveries to Fabricators	Stocks Refined at End
January	114,652	531	85,100	91,941	280,510
February	109,041	702	70,864	74,457	275,375
March	123,441	583	93,824	93,235	279,804
April	124,846	176	87,747	99,193	273,070
May	118,615	262	95,564	115,197	255,234

Note: The statistics do not balance largely because of deliveries to the U. S. stockpile. During May, large shipments of Chilean metal took place under a deal closed recently to acquire 100,000 tons for the strategic reserve—Ed.

U. S. Aluminum Output

PRODUCTION of primary aluminum in the United States in May was 125,088 tons, a new monthly high. Monthly output for 1952, 1953, and the Jan.-May period of 1954, in tons, follows:

	1952	1953	1954
January	76,934	89,895	116,247
February	72,374	92,649	110,483
March	77,069	104,460	122,339
April	76,880	102,071	120,234
May	80,803	105,464	125,088
June	77,476	104,152	.....
July	78,368	109,285	.....
August	85,175	110,545	.....
September	76,882	109,333	.....
October	77,312	108,219	.....
November	74,639	105,637	.....
December	83,419	110,291	.....
(a)Total	937,331	1,252,011	.....
Final	937,330	1,252,013	.....

(a) Preliminary.

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated, tons of 2,000 lb. unless otherwise noted.

MISCELLANEOUS METALS

June 30, 1954

Aluminum ingot, 99 plus percent, lb.	21¼¢
Antimony, spot, lb., less than carload, in cases	31.97¢
In bulk, carload lots, f.o.b. Laredo	28.50¢
Bismuth, ton lots, lb.	$2.25
Cadmium, commercial sticks, delivered, lb.	$1.70
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.18
Cobalt, 97 to 99 percent, per lb.	$2.60
Germanium, lb.	$295.00
Indium, troy oz.	$2.25
Lithium, lb., 98 percent	$11.00 @ $14.00
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	60¢
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	27¢
Palladium, troy oz.	$21.00
Platinum (Official quotation wholesale lots) troy oz.	$84.00 @ $87.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$280 @ $285
Selenium, 99 plus percent, lb.	(b)$5.00 @ $6.00
Silicon, minimum 97 percent, carloads, lb.	18¢
Tellurium, lb.	$1.75
Thallium, 100 lb. or more, lb.	$12.50
Titanium, 99.3 plus, grade A, lb.	$4.72

(a) Includes U. S. duty. (b) Depending on quantity.

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per short ton unit	$43.00
Chrome Ore per long ton, f.o.b. cars Atl. ports, dry:	
44% Cr_2O_3 no ratio	$21.00 @ $22.00
48% Cr_2O_3 3 to 1 ratio	$44.00 @ $49.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$10.30
Mesabi bessemer	$10.05
Mesabi, non-bessemer	$9.90
Lead (Galena), 80 percent, Joplin, Mo., ton	$173.45
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties 98c @ $1.00 c.i.f. U. S. ports, duty extra. Long-term contract nominal at 85c. to 88¢., c.i.f. duty extra.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	60¢
Columbium-Tantalum, per lb., combined oxides	$3.40
Tungsten Ore, per unit of WO_3:	
Foreign 60 percent, c.i.f. U. S. ports, duty extra	$22.00 @ $23.00
Domestic, scheelite, 60 percent f.o.b. mill	$63.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	31¢
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$64.00

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	5½¢
Cobalt Oxide, 72½% to 73½%, ceramic grade, per lb.	$1.96 @ $1.97½
Copper Sulphate, 100 lb.	$10.35
Germanium Oxide, lb.	$142.00

ALLOYS

Ferrochrome, 65 to 69 percent, per lb. of Cr contained	24¾¢
Ferromanganese, 74-76% net ton, seaboard	$200
Ferromolybdenum, 55 to 65 percent Mo, lb. of Mo. contained	$1.32
Ferrosilicon, 50 percent per lb. of contained Si	12.4¢
Ferrotungsten, 75 to 80 percent lb. of W contained	$3.80
Ferrovanadium, per lb. of V delivered	$3.00 @ $3.25
Silicomanganese, Max. 1½ percent carbon, lb. per contracts	11.4¢
Spiegeleisen, per long ton, 19 @ 21% grade	$86.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:	
Crude No. 1	$960 @ $1,500
Crude No. 2	$595 @ $900
Spinning fibers	$321 @ $514
Shingle fibers	$150 @ $200
Paper stock	$109 @ $137
Waste	$77
Shorts	$35 @ $70
Asbestos, f.o.b. Vancouver, B. C. (U. S. funds):	
Spinning fiber, 3-K	$460
Shingle fiber, 4-K	$185
Asbestos, Vermont, f.o.b. Hyde Park:	
Spinning fibers	$279.50 @ $302.00
Shingle stock	$135.00 @ $161.00
Paper stock	$81.50 @ $115.00
Waste, stucco or plaster	$71.40
Refuse or Shorts	$34.00 @ $64.00
Barytes f.o.b. cars:	
Georgia, crude, per ton	$15.00
Missouri, 94 percent $BaSO_4$, per short ton	$13.25
Bauxite long ton, f.o.b. point of shipment:	
Domestic crude, 50 to 52 percent (not dried)	(a) $5.00 @ $5.50
Domestic, chemical, 55 to 58 percent	(a) $8.50 @ $9.05
Domestic, abrasive 80 to 84 percent	(a)$18.00 @ $18.50
Feldspar, bulk ton	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @ $22.25
Glass feldspar, white, 20 mesh	$11.75 @ $12.50
Fluorspar, f.o.b. mines, bulk, 70% effective, ton	$34.00 @ $35.00
60% effective CaF_2	$30.00 @ $32.00
Acid 97% concentrate, bulk, ton	$52.50
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 @ $14.00
Magnesite, per ton dead burned, bulk, f.o.b. Washington	$38.00
Mica—Domestic, f.o.b. mines. Punch 12 to 22¢. per lb. according to size and quality. Sheet clear, 1½ x 2 inch, 70¢. to 85¢.; 2 x 2 inch, $1.10 to $1.60; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40, 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet, ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton Scrap $25 and up.	
Ocher, Georgia, ton, in sacks	$26.50 @ $30.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	Not quoted
Sulphur, Texas, mines, long ton	$25.50 @ $27.50
Talc, f.o.b. works, ton:	
New York, purified	$18.50 @ $20.00
Vermont, extra white	$13.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$30.00

(a) Normal.

IRON AND STEEL

Pig Iron, gross ton, basic, Valley Furnaces	$56.00
Steel f.o.b. Pittsburgh, billets, net ton	$62.00
Structural shapes, 100 lb.	$4.10 @ $4.15

for lower cost control of moderately **Corrosive** fluids

Fig. 2651-A Gate

JENKINS

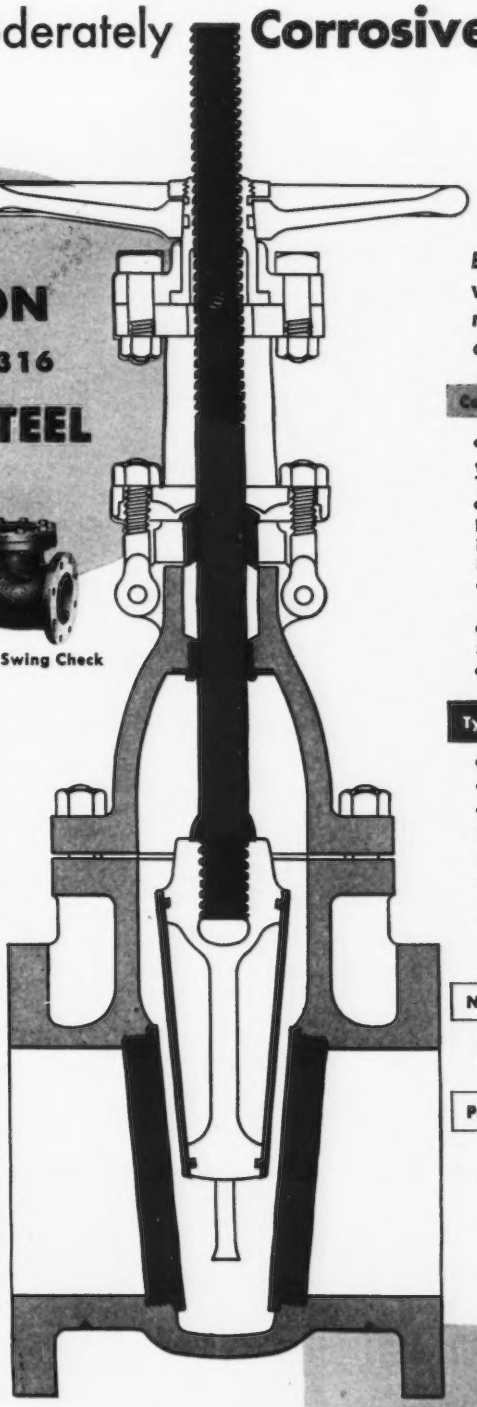
NICKEL IRON

Valves with Type 316

STAINLESS STEEL

Trim

Fig. 2624 Swing Check



Every part in contact with fluid is the right metal to block corrosion and beat wear.

Cast NICKEL IRON

- **BODIES** Heavy duty, dimensioned for greater resistance to wear and abuse. Through port design in Gate Valves.
- **BONNET** Rugged construction, like body. Swing-type gland bolts. Screwed-in back-seating bushing. Deep stuffing box.
- **YOKE** Integral with bonnet in 2" to 4" sizes.
- **WEDGE** In 10" to 24" sizes, with Stainless Steel Wedge Rings.
- **COVER** In Check Valve.

Type 316 STAINLESS STEEL

- SPINDLE
- GLAND
- BONNET BUSHING
- SPINDLE RING
- WEDGE PIN
- WEDGE RINGS Rolled into Nickel Iron Wedge in 10" to 24" sizes.
- SEAT RINGS
- DISC and HANGER in Check Valve

NI-RESIST Type No. 2

- WEDGE of I-beam structure is solid NI-RESIST in 2" to 8" sizes.

PRESSURE RATINGS

2" to 12"—200 lbs. O.W.G.
14" to 24"—150 lbs. O.W.G.

This combination provides corrosion resistance well above the moderate need in many processing services with an investment well below that for all-stainless steel valves.

Designed primarily for the chemical process industries, they are recommended for control of mildly corrosive liquids with minimum quantities of mineral acids, such as creosote in wood treatment, and many liquids carried in petroleum processing.

A major use is in pulp and paper processing, particularly in lines serving the digester, and in the chemical recovery cycle. Service records in lines carrying the valve-punishing "black liquor" give Jenkins Nickel Iron Valves top performance rating.

Jenkins *extra value* construction throughout. Get details — compare. See why they stretch your valve investment dollar — with longer service life, lower maintenance cost.

ALSO RECOMMENDED for fluids used in electroplating, photograph finishing, textile bleaching, dyeing and finishing and heat treating of metals.

GET COMPLETE SPECIFICATIONS from your Jenkins Valve Distributor, or write: Jenkins Bros., 100 Park Ave., New York 17. Ask for Bulletin 118.

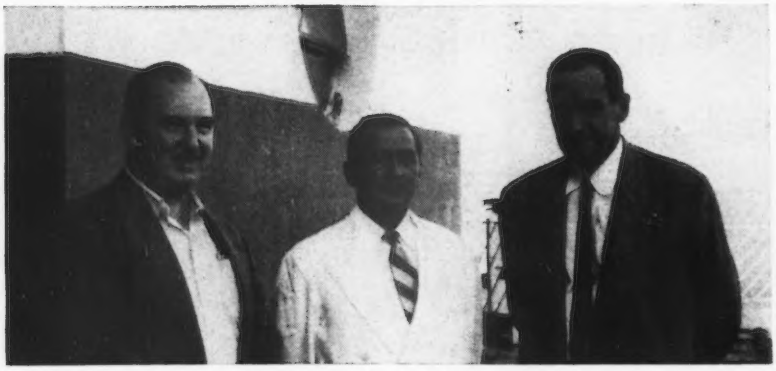
JENKINS VALVES

LOOK FOR THE DIAMOND MARK

SINCE 1864 JENKINS MARK

Jenkins Bros

PERSONAL NEWS



Dr. Eudoro Sanchez Lanz (center), Governor of the State of Bolivar, Venezuela, was host at a reception to 24 delegates to the recent Inter-American Conference at Caracas. Shown above with the Governor are **Admiral O. C. Laird,** director of public relations for Orinoco Mining, and **Walter J. Donnelly,** U. S. Steel special representative, who arranged a chartered flight for the delegates to Puerto Ordaz, Cerro Bolivar, and Ciudad Bolivar, where the reception was held.

Robert Baxter, Hibbing, Minn., is now general pit foreman at the Erie Mining Co.'s commercial pit, located near Aurora.

R. C. Mahon, superintendent of M. A. Hanna mines in Mineral Hills, Mich., has retired after 42 years of continuous service at the Homer mine. Mr. Mahon will continue with the company in an advisory capacity. **James Ivers, Jr.,** general engineer of the Iron River district, has succeeded Mr. Mahon at Homer and **J. D. McAuliffe** has been named superintendent at the Wauseca mine.

Harris Neil, who is now with Pickands, Mather's Buck group in Michigan, was formerly with the Mineral Hill area's James Mine.

Harold J. Richards, general superintendent of Pickands, Mather & Co. on the Menominee range, in Michigan, has announced the transfer of **Kenneth Engeldinger,** mining engineer to the western Mesabi; **Ellis Helge Jr.** and **Guerdon Jackson** to the eastern Mesabi. The relocation was required by a decline in the demand for the Menominee's high phosphorous iron ores.

William L. Daoust, acting chief of the conservation dept.'s geological survey division (State of Michigan) for the past 1½ years, is now state geologist.

Carroll L. Wilson, former director of Industrial Development of Climax Molybdenum, has left that company to become vice president and general manager of Metals and Controls Corp., Attleboro, Mass., according to an announcement of **Rathbun Willard,** chairman and president.

B. M. Larsen, supervisor of metallurgy research, U.S. Steel; **William C. Bell,** Stewarts and Lloyds Ltd., Great Britain; and **W. A. Black,** chief electrical experimental engineer, Republic Steel, were awarded medals by the American Iron and Steel Institute.

A. W. Mullan is now with McPhar Geophysics, Toronto, serving as field geologist.

Dr. A. F. Banfield, of Behre Dolbear & Co., has been examining glass sand deposits in Alberta, and **Parke A. Hodges,** of the same firm, is in Colorado, having recently returned from a trip to Cuba.

Evan Just, vice president of Cyprus Mines Corp., and former editor of *E&MJ,* was the commencement speaker at the 54th annual commencement at the Montana School of Mines, where he was the recipient of an honorary degree of Doctor of Engineering.

John M. Patterson, of the Beryllium Corp., has been awarded a Certificate of Service by Commerce Secretary **Sinclair Weeks** for his contribution to the mobilization program in the NPA as advisor on rare earths.

George B. Coale, former assistant manager of the Baroid Sales division, National Lead Co., has succeeded **George L. Ratcliffe** as general manager. Mr. Ratcliffe will remain in his capacity of vice president of National Lead.

Vernon Swan has been made manager of of Reynolds Metals Co.'s Plant 5, at Camp Ground Road, Louisville, Ky. He was formerly supervisor of ingot products for the firm.

Paul E. Young was appointed mine manager and **Donald E. Smith** became general superintendent at Pronto Uranium Mines, Ltd., Toronto.

Ralph D. Parker, of Copper Cliff, Ont., Can., has been elected general manager, Canadian operations, for International Nickel Company of Canada, Ltd. **Walter C. Kerrigan** has been made assistant to the president and **Herbert G. Fales,** assistant to Inco's chairman.

Marvin L. Kay, vice president and manager of Climax Uranium Co. at Grand Junction, Colo., was named president of the Colorado Mining Assn., succeeding **Harold Worcester,** of Montrose, who died suddenly after his election to the office last winter.

Edwin H. Crabtree Jr., former director of milling for Eagle-Picher at Miami, Okla., has been named deputy manager of the Grand Junction operations office of the AEC, and **Charles A. Tonry** was named director of the processing division of the office.

Glen W. Wensch will be the metallurgical engineering representative of Vitro Corporation of America at the atomic power reactor project now under study by 26 associated firms.

K. J. Finucane has been retained as consulting geologist by Rye Park Scheelite N. L. at the firm's uranium prospecting site in the Northern Territory.

H. Loevenstein, Harvey Aluminum engineer, has been transferred to Salem, Ore., where he will be in charge of research.

Roman T. Wasilewski, metallurgist, is in Cheshire, England, with Erlbrac, Ltd., located at Altrincham.

R. W. Coxon and **W. MacDonald,** director of mines and inspector of mines, respectively, for Northern Territory, Australia, have joined Uranium Development and Prospecting N. L.

Management changes at Chemical Construction Co. recently included: Retirement of **A. Magnum Webb** as vice president and sales manager; **J. H. Ruskin** promoted to executive vice president; **Martin de Simo** and **G. I. Seybold** to vice presidents and **T. P. Forbath** to assistant to the president.

David Mayers, works manager at the Kaiser Trentwood rolling mill at Spokane, Wash., has been made projects manager for the foil and sheet expansion department of the firm. He was succeeded by **Marvin L. Lee,** former works manager of the aluminum extrusion plant at Halethorpe, Md.

(Continued on p 112)

Strictly NOT for easy drying problems!

Typical Dorrco FluoSolids System utilizing single-compartment Reactor for critical temperature drying.

FluoSolids* — ***designed for the job where exact temperature control is essential to eliminate or induce chemical or physical raw material change.***

If you merely want to remove free moisture and don't need close temperature control — read no further. But if temperature variations in your drying operation are important — if you have to avoid chemical or physical changes in your raw material like poison — or even if you have to induce them — FluoSolids may be your answer.

Why FluoSolids? Well, mostly because it involves techniques that are radically different from conventional drying methods. More specifically, because it lets you control temperature precisely and automatically (within 10 to 20 degrees). You'll get completely uniform temperature throughout the entire fluidized bed without hot spots — and that means product uniformity. Oil, Gas or Coal can be used as fuel.

There are other advantages too. You can cut fuel requirements by the use of a multiple compartment FS Reactor — which puts otherwise wasted heat to work. You'll find operating costs low because of complete yet simple instrumentation. And maintenance costs are surprisingly low because no moving parts are required in the Reactor itself.

Important point is though, FluoSolids is the best answer yet to the critical temperature drying job. And from the capacity standpoint, single units can handle from 10 to 500 tons per day depending upon individual job requirements.

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William J. Welch, a director of National Lead and manager of its metal department, was elected a vice president and a member of the executive committee of the firm.

Herbert W. Rogers, Minneapolis, former secretary of Lithium Corp. of America, was named president of the firm, filling the vacancy caused by the death of **Karl M. Leute.**

Douglas C. Corner, formerly with John Carruthers & Co., of Sydney, Australia, is now serving as mining engineer with the American Zinc, Lead and Smelting Co. at Spokane, Wash.

Lloyd G. Henbest, geologist, paleontologist with the USGS, has been awarded the "best paper" prize by the Society of Economic Paleontologists and Mineralogists.

Robert M. Hurst, formerly with AS&R at Vanadium, N. M., is now with Miami Copper Co. at Miami, Ariz.

Ralph Flow is now with Foote Mineral Co., Kings Mountain, N. C.

Arden Swanson, mining engineer, has joined the staff at Anvil-Palms mine of Pickands, Mather & Co. on the Gogebic range.

Claude Gitzen, Crystal Falls, is surface foreman at the M. A. Hanna Cannon mine in Michigan.

Jay A. Poll, former superintendent of the Humboldt mine of Cleveland-Cliffs Iron Co. at Ishpeming, Mich., is now at Nicaro, Cuba, as assistant general plant superintendent for Nickel Processing Co.

Donald H. McLaughlin, president of Homestake Mining Co., delivered the commencement address at the 57th annual graduating exercises of the New Mexico Institute of Mining and Technology.

Jack S. Roper, former manager of Howe Sound's Snow Lake mine in Manitoba, Can., has succeeded **John J. Curzon,** manager of the Chelan division, at Holden, Wash.

S. A. Montague, president of Spruce Pine Mica Co., Spruce Pine, N. C., was elected president of the Mica Fabricators Assn.

R. S. Sherwin, of Reynolds Metals Co., has been transferred to Corpus Christi, Tex. Mr Sherwin was formerly at Sheffield, Ala.

E. Paul Lange, formerly of C. Tennant, Sons & Co., New York, has been appointed assistant secretary of the Engineers Joint Council, with headquarters in New York City.

Robert Henderson, former general superintendent of Climax Molybdenum, Climax, Colo., has been appointed resident manager, **Edwin Eisenach** was made assistant general superintendent and **William Wilson,** company controller.

DR. W. E. WRATHER, director of the U. S. Geological Survey, was received by PRESIDENT DWIGHT D. EISENHOWER at the White House on the occasion of the 75th anniversary of the founding of the Survey. Shown above are President Eisenhower, Dr. Wrather, Assistant Secretary of the Interior FELIX E. WORMSER and Secretary of the Interior DOUGLAS McKAY, who introduced Dr. Wrather to the President at the informal ceremony.

J. E. Harper has joined Chibuluma Mines Ltd., Chibuluma, Northern Rhodesia.

L. G. McCormack has been appointed superintendent of foundries at Newcastle Steelworks, Broken Hill Proprietary, N. L.

J. Barsby has been appointed manager of Wattle Gully Gold Mines, N. L., succeeding **Charles Martin,** who has retired.

OBITUARIES

Albert A. Hoffman, 73, vice president and director of Calaveras Cement Co., San Francisco, Calif., and a veteran mining engineer, died May 4 in Oakland, Calif., after a long illness.

David Todd Vance, 82, founder of the Tar Heel Mica Co. and the D. T. Vance Mica Mill at Plumtree, N.C., died May 10. Mr. Vance had retired in 1945.

George R. McLaren, 76, prominent Canadian consultant, passed away in Ontario. Mr. McLaren was, prior to his retirement some years ago, associated at various times with the Helen and Magpie properties, and at Stirling mines, Nova Scotia, and Paymaster, in Ontario's Porcupine camp.

Horace C. Young, 44, died suddenly at Montreal General Hospital. He had recently been in charge of exploration for the Newfoundland and Labrador Corp.

Laurence LaForge, 82, professor of geology at Tufts College from 1942 to 1945, died at his home in Cambridge May 29. Prof. LaForge had been associated with the USGS, Harvard University and Tufts.

James F. McCarthy, 50, mining company executive and inventor, died May 17 in San Francisco. Former president of Hecla Mining Co. Wallace, Idaho, he also served as superintendent of the Polaris mine, also in Idaho. He organized Bitco, Inc. with headquarters in Wallace, to market the bit he invented. His death was attributed to a cerebral hemorrhage.

James O'Grady, 86, one-time general manager of Anaconda Copper Mining Co.'s Boston and Montana reduction department in Great Falls, Mont. died May 14. He joined ACM in 1893 and became head of the reduction department in 1913. In 1917 he moved to New York City and joined a subsidary of ACM.

Herbert C. McCloskey, 69, a leading Canadian mining executive, died suddenly May 19 after suffering a heart attack in his office at Toronto.

Dugald McPherson, 31, plant engineer for Sherritt Gordon, died suddenly on March 31.

Harry J. Kuntz, 42, owner of a diamond drilling company in the Malartic area and active in mining exploration, died in a Toronto hospital May 20.

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Results of these tests have established new methods, developed better ways of recovery and improved processes. Engineering data, so obtained will be regarded as strictly confidential.

Safe, proven results obtainable through test runs involve crushing, grinding, screening and kiln operation, and provide fundamental insight on production problems regardless of the nature of the method or material being analyzed.

Take the GUESS out of your Production Problems. Eliminate all guess work in establishing the proper recommendation for the machine best suited for the job. KVS research is available on a non-profit basis. Arrangements can be made for a test run upon application.

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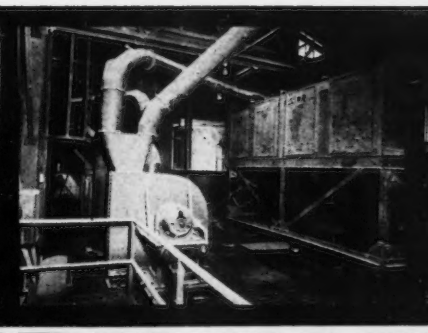
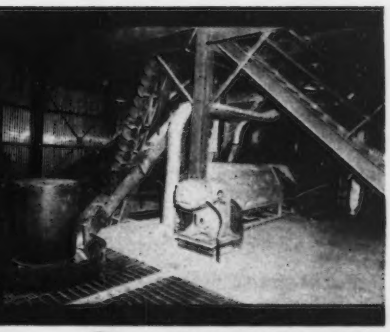


Top of Gyratory Crusher and Asbestos Graters



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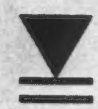

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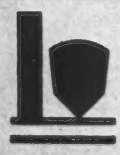

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New Books

The Spectrum of Steel. A table for the selection of homologous spectral lines by John Convey, Director Mines Branch; and J. K. Hurwitz, Physical Metallurgy Division, Department of Mines and Technical Surveys, Ottawa, Canada. Listed as Report No. 848. Pp 55. Price $1.

DuPont Blasters' Handbook, Revised Sesquicentennial Edition. A manual describing explosives, and practical methods of using them, prepared by the Technical Service Section of the Explosives Department, E. I. du Pont de Nemours & Co., Wilmington 98, Del. Pp 479. Price $1.75.

Differential Equations in Engineering Problems. By Mario G. Salvadori, and Ralph J. Schwartz, engineering staff, Columbia University. Published by Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. Pp 432. Price $8.65.

A Guide to Technical Writing. Second Edition. By W. George Crouch, Professor of English, University of Pittsburgh; and Robert L. Zetler, Chairman Department of English, Pennsylvania College for Women. Published by the Ronald Press Co., 15 East 26th St., New York 10, N. Y.

Manual of Excellent Managements, 1954 Edition. Published by the American Institute of Management, 125 East 38th St., New York 16, N. Y. The first 30 pages of this text cover the elements of good management and a case history—National Cash Register Co. which has made great strides in the perfection of management. The balance of the book cites companies which were found to be "excellently managed" during 1954. Among the names of "excellently managed" companies in the mining and metals field, we find the following: Aluminum Co. of America; American Metal Co., Ltd.; Consolidated Mining and Smelting Co. of Canada, Ltd.; Freeport Sulphur Co.; Hudson Bay Mining and Smelting Co., Ltd.; International Nickel Co. of Canada, Ltd.; Johns-Manville Corp.; Kennecott Copper Corp.; Monsanto Chemical Co.; National Gypsum Co.; National Lead Co.; New Jersey Zinc Co.; Newmont Mining Corp.; Noranda Mines, Ltd.; Phelps Dodge Corp.; St. Joseph Lead Co.; Texas Gulf Sulphur Co.; Union Carbide and Carbon Corp.; United States Gypsum Co.; United States Smelting, Refining and Mining Co. Copies of the manual may be obtained from the American Institute of Management, 125 East 38th St., New York 16, N. Y.

Non-Ferrous Foundry Metallurgy. The science of melting and casting nonferrous metals and alloys. Edited by A. J. Murphy, Professor of Industrial Metallurgy, University of Birmingham. Published by the McGraw-Hill Book Co., 330 West 42 St., New York 36, N. Y. Pp 497. Price $12.50.

Aufbereitung Barbaulicher Rohstoff. By Prof. Dr.-Ing. Helmut Kirchberg, Director of the Institute of Ore Dressing, Freiberg (Sachsen). A textbook covering the major processes involved in crushing, grinding, concentrating and recovering valuable minerals from ores. Published in German by Wilhelm Gronau-Verlagsbuchhandlung Jena, Humboldtstrasse 23, Germany. Pp 425. Price 19 DM.

Sudbury Basin—The Story of Nickel. By D. M. LeBourdais. An interesting history, geological description, and factual account covering the famous Sudbury Basin of Ontario. Written in easily readable, popular style. Published by Ryerson Press, Toronto, Ontario, Canada. Pp 210, plus colored geologic map of the Sudbury Basin in covers.

Tafeln zum Bestimmen der Minerale nach Ausseren Kennzeichen. By Prof. Dr. H. v. Philipsborn, Custodian of the Mineralogical Museum, Institute of the University of Bonn. Tables to assist in the identification of minerals; listing chemical composition, luster, color, streak, hardness, crystal habit, specific gravity, occurrence. Supplementary tables cover crystal forms, microscopic and optical characteristics of minerals. Published in German by E. Schweitzerbartsche Verlagsbuchhandlung, Stuttgart-W, Johannesstr. Pp 244. Price DM 17.

Business, Legal, and Ethical Phases of Engineering. New Second Edition by D. T. Canfield, and J. H. Bowman, Professors of Electrical Engineering, Purdue University. Published by the McGraw-Hill Book Co., 330 West 42 St., New York 36, N. Y. Pp 365. Price $6.

Elementary Fluid Mechanics. Third Edition by John K. Vennard, Professor of Fluid Mechanics, Stanford University. A good basic textbook on fundamentals of hydraulics with problems. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Pp 401. Price $5.50.

Metals and How to Weld Them. By T. B. Jefferson, Editor, THE WELDING ENGINEER. Published by the James F. Lincoln Arc Welding Foundation, Cleveland 17, Ohio. Pp 322. Price $2 in the U. S. A., $2.50 elsewhere.

Welding Processes and Procedures. By Joe L. Morris, Associate Professor of Mechanical Engineering, Georgia Institute of Technology. Published by Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. Pp 255. Price $5.

Flow and Fan. Principles of moving air through ducts by Prof. C. Harold Berry, Gordon McKay Professor of Mechanical Engineering, Harvard University. Published by The Industrial Press, 148 Lafayette St., New York 13, N. Y. Pp 226. Price $4.

Antimony, Revised Third Edition. By C. Y. Wang, Director of Research, Wah Chang Corp., New York. An authoritative book covering the geology of antimony, metallurgy of antimony, industrial uses of antimony, and the economics of antimony. Published by Chas. Griffin & Co., Ltd., 42 Drury Lane, London, W. C. 2. Pp. 170. Price 25s net.

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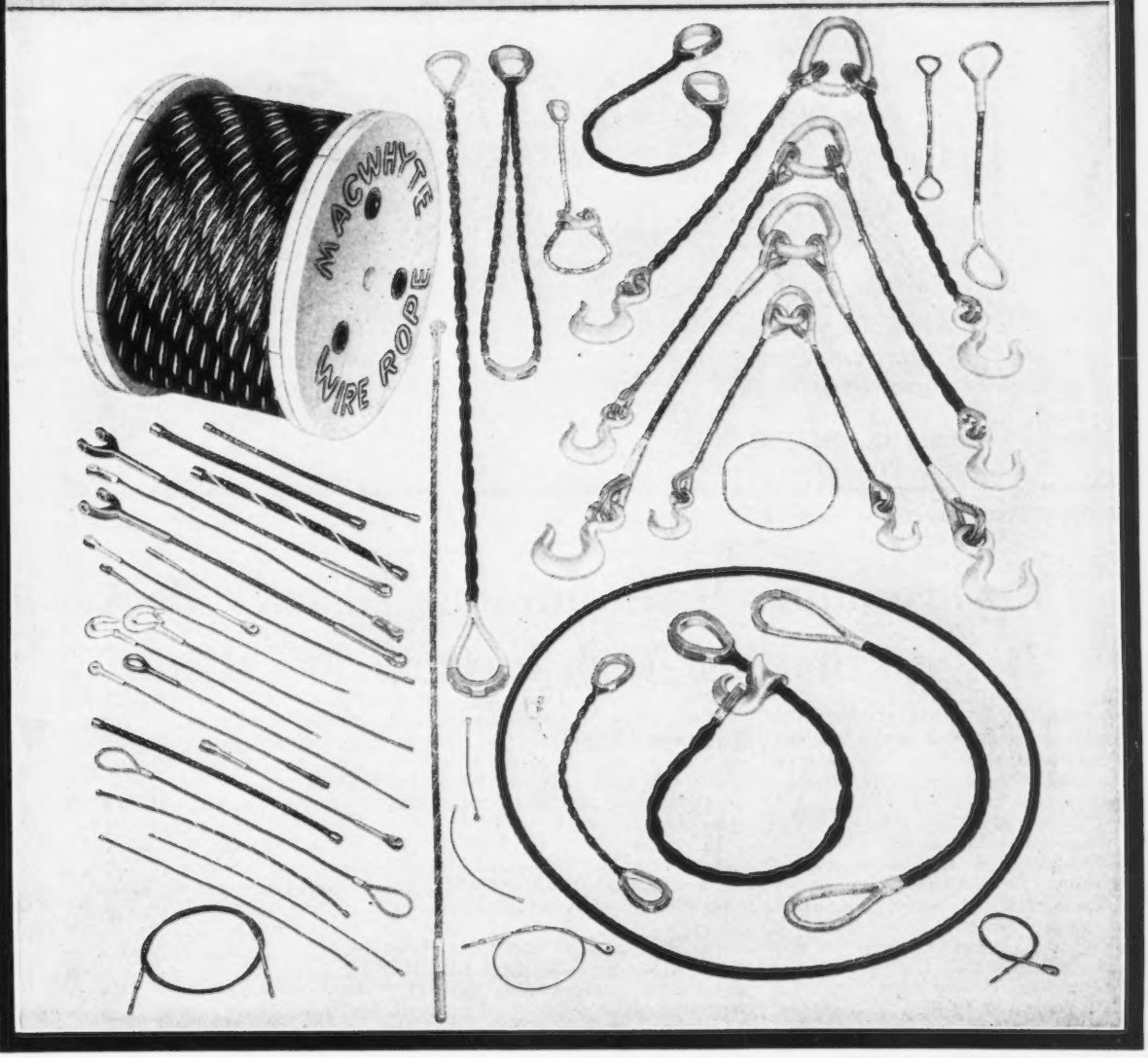

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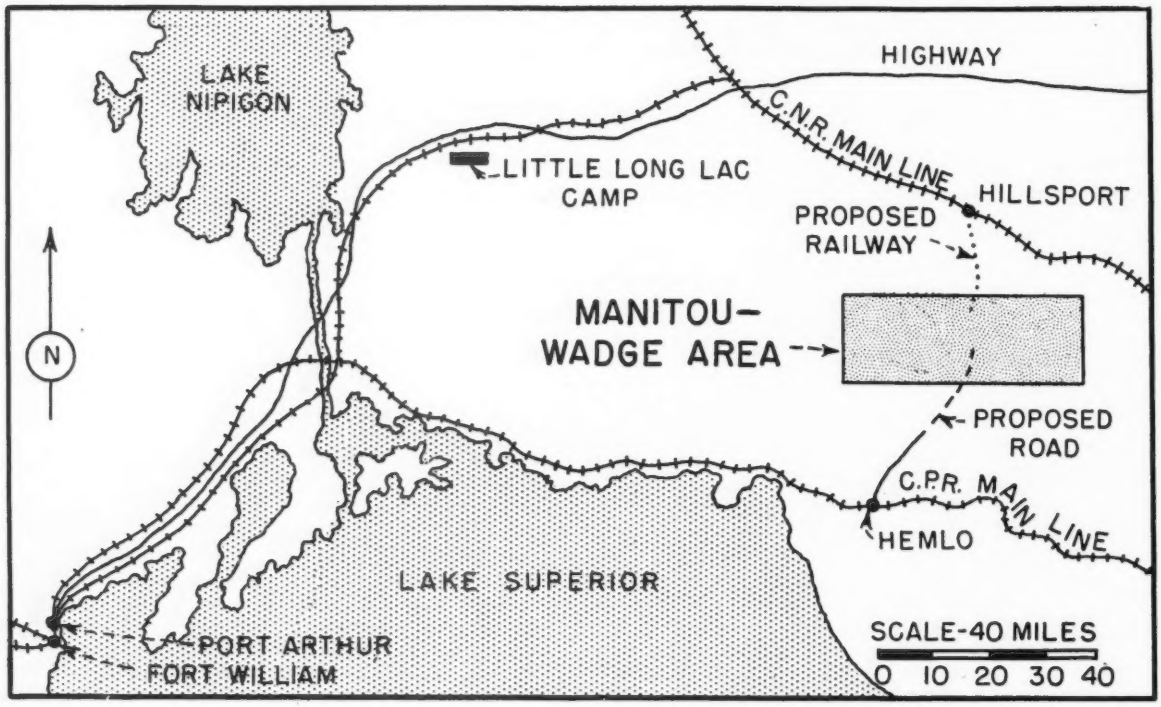


PROSPECTORS SWARMING over Ontario's Manitouwadge area have staked more than 8000 claims since early last winter.

Mushrooming Manitouwadge District Marks Biggest Staking Rush In Ontario's History

ALTHOUGH A DORMANT WILDERNESS just a little more than a year ago, Ontario's Manitouwadge area today is the scene of the busiest mining development activity in Canada.

This feverish activity stems from discovery last spring of outcroppings of high grade copper with values in silver and zinc. The discovery was made by a trio of Geraldton residents who noted the words "gossan" and "sulphides" on a 21-year-old government geological map and decided to take a closer look (see *E&MJ*, April 1954, p 121).

Claims staked by the trio turned out to be the find of the year. The rush, however, didn't gather momentum until early last winter. This was partly because these first stakers were able to work unnoticed because of the area's remoteness, partly because the first drilling wasn't spectacular, and partly because many experts were hard to convince.

While the rush was slow in starting, it soon accelerated. No one is sure just how many claims have been staked but the number exceeds 8000. An east-west belt almost 40 mi wide has been blanketed solidly (see map). Many months will pass before it is fully prospected.

W. S. Hargraft, consulting engineer, The General Engineering Co. Ltd., described the geology of the area in a paper presented before the Prospectors & Developers' Association convention last March.

Hargraft credited J. E. Thompson, Ontario Department of Mines, who mapped the area in 1930-31, with furnishing the only existing geological information on the area.

The presence of sulphides was noted north of Manitouwadge Lake in a narrow band of schistose rocks. There is a fairly widespread series of old sediments and volcanics intruded by masses of granite and diorite.

Pegmatic dikes are common in the area, especially in the vicinity of the granite. Diabase dikes 50-100 ft wide cut all rocks and also ore which has been found on claims of Geco and Lun-Echo, two biggest property-holders.

Older rocks have been folded and schisted in easterly tending zones. A major fold is clearly indicated on aerial photographs. Surface observations suggest a broad syncline with the trough on the Lun-Echo property (see map) pitching to the east.

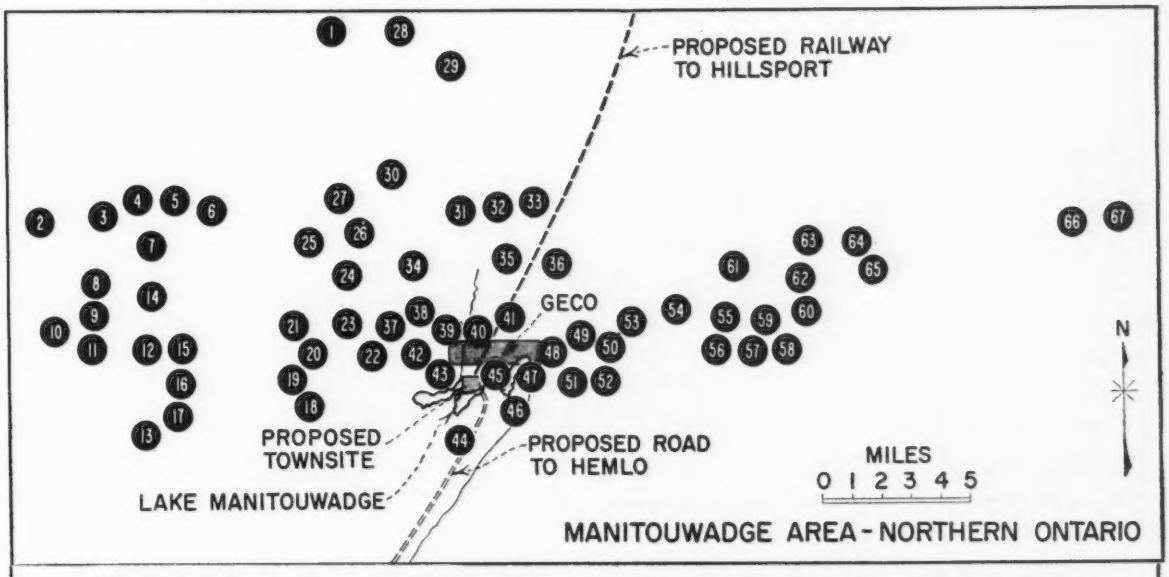
The northern limb strikes northeasterly through Man-Echo; the southern limb goes through Willroy and Geco Mines.

Holdings of Geco, Willroy and Lun-Echo command attention. Even among the leading three, however, Geco stands alone.

Exploration on Geco property to date has been limited to surface drilling, plus examination of the few outcroppings. Although work has been progressing since late 1953, the picture is only now beginning to take shape. More than 10-million tons of good grade copper-zinc-silver ore is indicated to a depth up to 600 ft. There are excellent possibilities that it will carry well to depth on its easterly rake. Less than one-quarter of the property's 4-mi length has been explored. Officials are talking confidently of an operation with initial milling capacity of 5000 tons daily. Town planners are thinking in terms of 15,000 inhabitants by 1970.

First, however, must come road, railway and airstrip. The airstrip probably will be deferred a while because terrain near the townsite is rugged. Several small lakes in the area provide adequate sea-

IN MINING



Alphabetical Key to Properties in Ontario's Manitouwadge Area

Allerson Copper, 7
American Yellowknife, 60
Area, 49
Athona, 63
Barymin, 17
Bobjo, 1
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Mentor, 4
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Sudbury Contact, 5
New Vinray, 55
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Willroy, 42

plane bases and these will be used until exploration discloses directions in which the camp may expand.

The road, however, already is on the way. An old lumbering road extends within 12 mi of Geco. This is being improved and lengthened to provide direct ingress from the south. Eventually, a first class highway will be constructed, to join the Trans-Canada Highway that skirts Lake Superior to the west.

The railroad will come from the north, as a branch of the Canadian National Railway's trans-continental line. Surveyors already are plotting its course.

Meanwhile, Geco is proceeding with plans for mine and mill construction. Geco has appointed John A. Graham, former general superintendent, Quemont Mining Corp., as general manager, and C. Robinson, formerly with East Sullivan Mines, as resident geologist.

Following is a list of some of the more important mining companies holding claims in the Manitouwadge area:

Allerson Copper Co.: New company, with 18 claims 8 mi west Geco, raising funds for preliminary prospecting.

American Metal Co.: The well known big-timer; took early interest with an option on control of Pacific (Eastern) Gold Mines' well-located group, where drilling got under way in the late winter.

American Yellowknife Mines: One of the J. J. Byrne group of companies, with 22 claims, plus a large interest in the adjoining 15 claims.

Ankeno Mines: Holds 15 claims in the central section, and 18 claims at Nama Lake; had a magnetometer survey in progress by late May.

Area Mines: Long-established and strongly-financed exploration and holding company; was in early to snap up 18 claims just east of Geco. Has more than $400,000 in net current assets.

Athona Mines (1937) Ltd: Another Byrne company; holds 17 claims in the east section, with plans for aggressive exploration.

Barymin Co.: Diversified interests include gold, barite (Canada's sole producer), and bentonite. Staked 22 Manitouwadge claims in two groups as locational bets. Has plenty of experience in prospecting and well over $1-million.

Bellechasse Mining Corp.: Took an option on 24 well-located claims; is raising exploration funds.

Bidgood Kirkland Gold Mines: A veteran of Kirkland Lake, though long-departed from that field. Holds an 18-claim group on which a crew has been working several weeks.

Bobjo Mines: Named after, and headed by, Robert J. Jowsey and active for many years in many fields. Has a vast and diversified list of claim and share holdings, to which its Manitouwadge group (north section) added just one more ore item.

Buffalo Canadian Mines: Was one of the early birds; picked up 18 claims last winter adjoining the Lun-Echo

(Continued on p 118)

Manitouwadge (*Continued*)

property on the southwest. Had a surface crew at work before snow melted.

Charles Long Lac Gold Mines: After several dormant years, took a new lease on life this spring to acquire 14 claims; completed a geophysical weeks ago.

Clinger Gold Mines: Holds two big groups, well spotted, totaling 68 claims; has a crew in the field, backed up by $85,000 in the bank.

Columinda Metal Mines: Originally interested in base metals in British Columbia, then in Beaverlodge's uranium; secured a stake in Manitouwadge as vendor of the Rock-Echo ground. Will probably also help finance that company.

Consolidated Howey Gold Mines: Stands to profit from the new camp in a big way. Is the largest individual shareholder of both Geco Mines and Willroy Mines, and holds 50% interest in 39 claims, all close by, on its own account. By late spring had a potential paper profit of $5-million on its Geco and Willroy holdings.

Consolidated Matarrow Mines: Has a group well out in the western part of the camp, with plans for surface work later in the summer.

Consolidated Mosher Mines: Ventures Ltd. shows up in Manitouwadge through this company, which it controls. While its principal interest is in its Little Long Lac gold prospect, Consolidated Mosher holds approximately 1-million shares on Lun-Echo and 150,000 shares of Man-Echo Mines.

Conwest Exploration Co.: Another company with enough early foot to stake good ground close to Geco. Holds vendor interest in Hucamp Mines and Kenlew Mines, both working actively.

Coulee Lead & Zinc Mines: With lots of know-how and a quarter million in cash, Coulee got in early to acquire the 32 claims in which it has controlling interest; work has been in progress for weeks.

Delmico Mines: With 34 claims adjoining west of Willroy, and on line of strike with the Geco and Willroy surface showings, Delmico had no trouble raising $575,000 in its first offering of shares, and lost no time taking in a drill. Control is held by New Delhi Mines.

Dunvegan Mines: Holds 30 claims in the central section, and a start made on geophysical work.

Empire Oil & Minerals Ltd.: Well out to the east, some 5 mi from Geco, holds a 1600-acre block of 39 claims. Had a crew on the ground starting geological work by mid-spring.

Geco Mines: The cause of all the commotion; see main part of this story.

Glenburk Mines: Busy working on good looking ground just north of the Willroy property; well-financed.

Glenrock Mines: Has completed an aeromagnetic survey on 15 claims, and is starting surface prospecting.

Goldcrest Mines: Another company in the Byrne group; holds ground in the east section. Plans thorough prospecting.

Goldmaque Mines: Added Manitouwadge ground to its other interests early this spring; plans work later in the year.

Grandines Mines: Jointly with Anacon Lead Mines and New Harricana Mines is exploring a 16-claim group 10 mi west of Geco.

Greenlee Mines: Has crew at work in the east section.

Hard Rock Gold Mines: Former Little Long Lac gold producer with $100,000 in the kitty. Took 14 claims south of Geco as a locational bet; should work all summer.

Headway Red Lake Mines: Originally in Red Lake, more recently in New Brunswick, Headway increased its diversity by staking 18 claims early. Has $70,000, can easily raise more.

Hewbet Mines: An old company revamped by M. J. Boylen (of Bathurst fame) to take on one of the best locational prospects in the camp; 11 claims tieing on to Geco's east boundary, and on strike of the main showing (though still some distance away). Has an intensive program laid out.

Hucamp Mines: Controlled by Conwest Exploration Co. Holds 11 claims tied onto Geco's north staking line. Raised $160,000 for drilling by an offer of rights to Conwest shareholders.

Jackson Basin Mining Co.: A British Columbia company that has turned its attentions eastward. Has 18 claims, and is raising funds for work on them.

Jesko Uranium Mines: Went north to stake 9 claims some 8 mi from Geco at Everest Lake.

Kenlew Mines: Conwest and MacLeod-Cockshutt Gold Mines combined on this one, with 30 claims a short distance northwest of Geco. Has had a crew on the ground for some weeks.

Killala Lake Mines: One of the landed gentry; formed by strong mining interests to take on big acreages following a 25,000-sq mi airborne geophysical survey. In addition to a group some miles east of Geco, holds ground at Killala, Bamoos, and Cirrus Lakes, all in the Port Arthur mining division. Will be busy all summer on surface follow-up.

Laco Mines: Subsidiary of Little Long Lac Gold Mines, formed to take on 66 claims adjoining Lun-Echo Mines on the east.

Lake Kaginu Mines: A Noranda-Mining Corp. venture embracing 23 claims along Geco's south boundary on which crews will be busy all season, the two parent companies sharing 50-50 in financing.

Larum Mines: Holds 36 claims in the west section. Geophysical work started weeks ago.

Lexindin Mines: Planning surface work on a 13-claim group a couple of miles south of the Geco showing.

Lun-Echo Mines: One of the first in the field, Lun-Echo staked a big block of claims last summer, keeping 50 for its own account and turning others over to Man-Echo Mines for 21,250 shares. Started drilling in February, having one of the few properties with showings to be seen on surface; had no trouble in raising $1-million in the early financing excitement.

MacLeod-Cockshutt Gold Mines: Busy prospecting its 21-claim group southeast of Geco. Has a substantial interest in Larum, 120,000 shares of Kenlew, and 12,385 shares of Geco which show MacLeod a handsome profit, having been received for claims sold to the big prospect. A profitable gold producer, MacLeod has more than $900,000 to work with.

Man-Echo Mines: A locational bet adjoining Lun-Echo on the northeast. Has 24 claims on good structure, and $100,000 in the bank. Started prospecting early in June.

Marbenor Malartic Mines: Picked up 36 claims to further diversify its holdings located in various camps from Barraute to Beaverlodge.

Mentor Exploration Co.: Secured two groups, 15 claims and 28 claims, a short distance west of Lun-Echo, and has work laid out for both; has strong financial backing.

Minda Scotia Mines: One of the Mindus Corp. group; is doing geophysical work in the eastern part of the camp.

Mining Corporation of Canada: Holds 100,000 shares of Geco, or possibly more, and has a 50% interest in Lake Kaginu Mines, adjoining Geco's south boundary; also reported acquiring claims on its own account.

Moneta Porcupine Mines: An established exploration company with experience and capital, and a well-located group on which prospecting started weeks ago.

Monpre Uranium Exploration Ltd.: Holds 9 claims, for which geophysical work is planned.

Nama Creek Mines: Has been drilling since May on 13 claims just north of the Willroy. One of the newest Boylen companies with an older one, United Montauban, as vendor, for which the initial stock offering was heavily oversubscribed to provide $375,000.

New Fortune Mines: Holds two groups, 26 and 27 claims. Has $45,000 available to finance preliminary work.

New Harricana Mines: Jointly with Anacon Lead Mines and Grandines is exploring a group staked as a locational bet in the west section of the camp. Line-cutting for survey work started early in June.

New Highridge Mines: With plenty of cash in the box (raised in last year's Bathurst rush) this M. J. Boylen company plans thorough testing of its ground, some 10 mi west of Geco.

New Vinray Mines: A Mindus Corp. subsidiary with a group adjoining Rock-Echo (also in the Mindus stable) 7 mi east of the Geco. Plans geophysical work.

Norgold Mines: One of Denison Denny's companies; has an option on 18 claims, two groups, away out in the eastern part of the camp.

Norpax Oils & Mines: Holds 44 claims, and will be working during the summer. Has $45,000 to carry on.

Northland Mines: Early in June was arranging to send a prospecting crew in for work on its nine-claim group.

Nu-Age Uranium Mines: A Beaverlodge company with Manitouwadge added as a sidelight. Holds 12 claims, and plans geophysical work.

Nubar Mines: Another of Boylen's Bathurst babies. Took 9 claims and started cutting lines for a survey in June; has $100,000 in the box.

Okleko Mines: Subsidiary of Oklend Gold Mines with a well spotted group not far from the Lun-Echo showings. Had geophysical and geological surveys in progress by mid-May, and $75,000 with which to keep things moving.

Oklend Gold Mines: Old-time prospect of the Little Long Lac camp, which arrived early on the Manitouwadge scene; see Okleko.

Orchan Uranium Mines: While marking time at its original Beaverlodge property west of Gunnar, looked about for opportunities and soon had ground in the west section of Manitouwadge. Has a crew on the ground and plenty of cash in the kitty.

Pacific (Eastern) Gold Mines: Has been drilling since winter on 18 claims in the central part of the camp. American Metal Co. holds option on control, and has provided the funds.

Paige Petroleums Ltd.: Plans surface work on a group of claims west of Lun-Echo.

Parbar Mines: Parbec Mines and Red Bark Mines couldn't agree on the staking lines of their two groups just north of Geco and Willroy, so they amalgamated them into a joint subsidiary; hence the name. Drilling has been in progress for weeks.

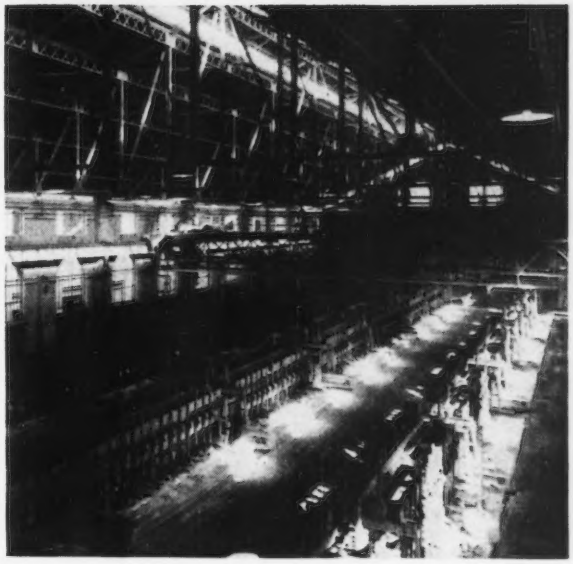
Prospectors Airways Ltd.: With 50% interest in 150 claims some miles east of Geco, this Noranda affiliate has an ambitious work program laid out.

Quyta Gold Mines: Holds 9 claims, with plans for work laid out some weeks ago; another of the Byrne group.

Roche Long Lac Mines: Prospecting started in June on the group held by this veteran prospecting organization.

(*Continued on p. 120*)

HIGH GRADE BAUXITE reserves support one of the major industries of France, birthplace of aluminum.



PECHINEY'S ALUMINA REDUCTION plant at Saint-Jean-de-Maurienne boasts 100,000-amp pots.

French Aluminum Industry Observes Centennial

Low-Cost African Power May Shift Production

FRENCH ALUMINUM INDUSTRY this month is celebrating its centennial. An exhibit on Paris' famed Left Bank traces industrial growth from the discovery of bauxite in southern France to the modern French plants of today. The exhibit opened June 12 and will close July 31.

Among United States representatives slated to take part in the Centennial celebration were W. T. Ennor, Aluminum Company of America; Richard S. Reynolds Jr., W. W. Binford, Thomas L. Fritzlen and George Perkins, all of Reynolds Metals Co., and F. J. Cservenyak, U. S. Bureau of Mines. The American committee is headed by William P. Bitenbender, president, International Selling Corp.

In the history of aluminum in France, three men stand out:

P. Berthier, a mineralogist, who while searching for iron ore in southern France, made the initial discovery in 1821 of a new metal. This metal Berthier called bauxite, after the nearby town of Les Baux.

Henri Sainte-Claire Deville, who in 1854 published research which made chemical production of aluminum an industrial, rather than a laboratory, possibility.

Paul Heroult, who in 1886 devised the electrolytic technique for aluminum production which remains fundamental to today's industry.

During World War II, the French aluminum industry suffered a severe setback. Since that time, however, the industry has made great progress. Capacity is now about 120,000 metric tons per year—about 5% of world output. In 1953, two major French aluminum companies produced slightly more than 112,000 tons.

DEVILLE

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Some 80% came from eight plants owned by Pechiney (Pechiney, Compagnie de Produits Chimique et Electrometallurgique). The remainder was produced by Ugine (Societe Electro-Chimie d'Ugine), which operates three plants. Both companies are efficient and their plants are generally modern, since capacity has doubled since 1945. Last year, Pechiney produced its aluminum with an average input of around 8.11 kwh per lb.

French Aluminum Production (in thousands of metric tons)

	1935	1945	1953
Bauxite	513	252	1150
Alumina	72	89	282
Aluminum	22	37	112

Both Pechiney and Ugine expect the demand for French aluminum to grow, and bold steps may be necessary to meet that demand. Despite large reserves of high-grade bauxite in France, a bottleneck in cheap power at home is causing them to look abroad for the next big development. Two opportunities in French territories in Africa are good prospects: one in the French Cameroons; the other in French Guinea.

The French Cameroons prospect appears the stronger. A government-built hydroelectric project is looking for customers for its power output. Domestic bauxite would be shipped to the Cameroons for processing; aluminum would, in turn, be shipped back to France for fabrication or export.

Technical and financial plans for setting up an aluminum plant in the Cameroons have been approved by the Fonds d'Investissement pour le Developpement Economique et Social. As now planned, the plant will require an investment totaling 23-billion francs and is scheduled to produce 45,000 tons of aluminum per year representing an annual turnover of 4-billion francs.

This program will be handled by two companies: Cie Camerounaise de l'Aluminium Pechiney-Ugine (Alucam) will build and manage the alumina reduction plant. A joint company (with government participation) will develop local hydroelectric power to feed Alucam.

The hydroelectric power station at Edea in the Cameroons, which already has a capacity of 20,000 kw, can be expanded to 140,000 kw at less cost than

was needed for the original installation. It was estimated that the power program would require 7-billion francs.

Much more interesting—and difficult—is a proposal for a completely integrated aluminum industry in French Guinea, on the Atlantic Coast just south of Dakar. Large bauxite deposits have been located there. Hydroelectric potential is substantial.

Optimists at Pechiney and in the French Colonial Office see a real prospect of developing in 10-15 years an industry of more than 100,000 tons capacity. But this prospect is definitely more remote because of two main hitches.

First, development on such a scale would require an investment of between $300-million and $400-million. And that much capital is hard to come by in France today.

Second, since every colonial development project today must be planned in terms of eventual self-government for the area, Frenchmen outside the Colonial Office wonder how wise it would be to concentrate their investment in The Guinea. They point out that such a development would dominate the French aluminum industry for several years.

The nod apparently already has been given to the Cameroons project. Regardless of which development is pushed, it seems certain that the French industry soon will be spreading to Africa.

Manitouwadge

(*Continued from p 118*)

Rock-Echo Mines: Controlled by Mindus Corp. through Columinda Mines; holds 13 claims about 7 mi east of Geco.

St. Michael's Uranium Mines: Formed last year by Graham Bousquet Gold Mines to prospect in Beaverlodge, St. Michael's turned its sights toward Manitouwadge early in the rush. Obtained 30 well-located claims adjoining Lun-Echo on the west; plans geophysical work.

Snare River Mines: Will be working later this summer on a group in the east section.

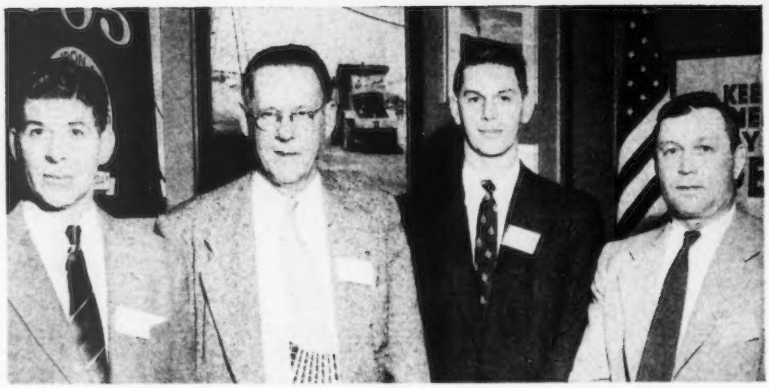
Sudbury Contact Mines: Geophysical survey and soil tests gave encouragement, and a surface prospecting crew was on its way to the property late in June; holds 15 claims about 2 mi west of Lun-Echo. Company also is active in Blind River and Beaverlodge.

United Montauban Mines: Has an indirect Manitouwadge interest as vendor of the Nama Creek property; holds 750,000 shares in that company.

Wadge Mines: Subsidiary of Brewis Red Lake Mines; started surface work and diamond drilling in June on good looking ground in the west section.

West Wasa Mines: Holds 54 claims, well out to the east. Had prospecting and magnetometer work under way late this spring.

Willroy Mines: Was one of the first to start drilling, being one of the original stakings (it was named after Roy Barker and William Dawidowich, the area's pioneers, who staked it). Good copper-zinc showings were found on surface along the line of strike from the Geco orebody, (Willroy adjoins Geco on the west) and diamond drilling has been in progress since March. Some good intersections have been had, a few of them showing dimensions and grade of ore calibre. The property is big (28 claims) and will be thoroughly tested, since sale of stock provided $1.25-million. Willroy is managed and controlled by Consolidated Howey.



Discussing Safety Problems are (l to r) R. F. Wilson, recent president, Lake Superior Mines Safety Council and supervisor of safety for Oliver Iron Mining Division; John A. Johnson, Council secretary and chief accountant, U. S. Bureau of Mines at Duluth; A. S. McClimon, Cleveland, sales development manager, Euclid Division, General Motors, and Arnold S. Johnson, pit foreman, Hull-Rust open pit mine.

Value of Employee-Cooperation Stressed At Lake Superior Safety Council Meeting

EMPLOYEE COOPERATION by all the men, all the time, is necessary for the success of any mines safety program.

This approach to accident-prevention problems was urged repeatedly at the 30th annual Lake Superior Mines Safety Council Conference at Duluth, Minn. Some 800 men, mostly mine foremen and supervisers, attended the meeting in Hotel Duluth, May 20-21.

R. P. Kirwan, assistant superintendent of Pickands, Mather & Co.'s Tioga No. 2 Mine, Grand Rapids, said that 98% of mining industry accidents stem from two major factors: defective working conditions and improper work practices.

Three Safety Tools

Kirwan prescribed daily use by supervisors of three safety tools. These tools he listed as careful explanation of safety precautions to employees; commendation to employees exhibiting safety-consciousness, and personal contact among employees to keep them safety-minded.

"We supervisors and foremen would be wise to take daily a personal inventory and try to view with a more kindly eye the problems mutual to the company and our men," Kirwan suggested. He added that "Our objective of good maintenance and good safety can be obtained only by the full cooperation of all the men, all the time."

Also underscoring the importance of employee-cooperation were A. A. Olson, Cleveland-Cliffs Iron Co. chief electrician at Ishpeming; A. H. Zeilinger, superintendent of safety, Colorado Fuel & Iron Co., Pueblo, Colo.; R. T. Elstad, president, Oliver Iron Mining Division, U. S. Steel; James Ivers, Jr., general operating engineer, M. A. Hanna Co. at Iron River, Mich..

Olson pointed out that "The hard work of safety engineers and management can never make good safety records without the full cooperation of foremen and leaders who must bring the proper procedures and methods to the men who work with the tools and equipment."

Zeilinger emphasized that "Interest in safety can't be rammed down men's throats, but by intelligent, continuous and vigorous leadership and salesmanship, much can be done in obtaining the employee's interest in safety."

Further strengthening vital importance of personal contact, Elstad cited findings that employees produce better under supervision of a man who demonstrates a sincere interest in the personal welfare of his men, more so than under supervisors who concentrate on production only and forget that men are individuals.

Ivers cautioned that the old saying, "A miss is as good as a mile" does not apply to industrial accidents.

New Officers Elected

A new slate of officers was elected for the coming year. Edward C. Norris, Jr., supervisor of industrial relations for Republic Steel in Duluth, who had been serving as vice president, was elected president. Norris succeeded Robert F. Wilson, supervisor of safety for the Oliver Iron Mining Division, also at Duluth.

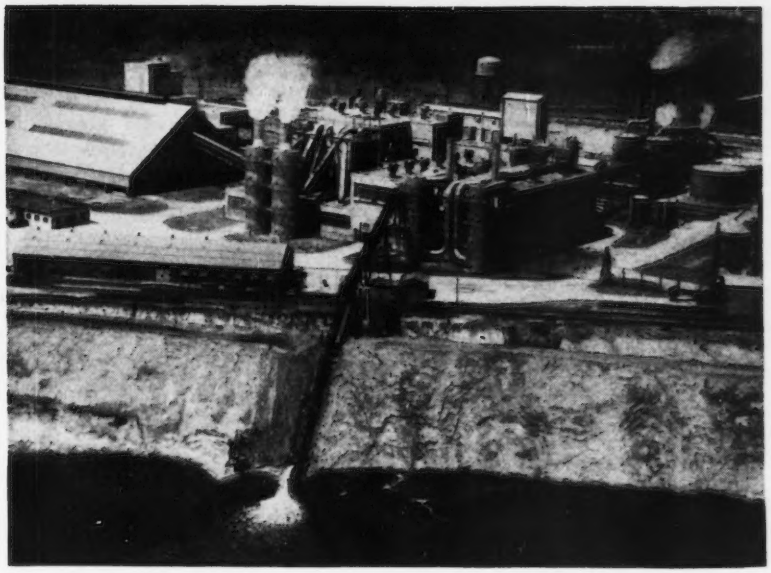
Edward C. Leonard, safety director for Inland Steel Co. at Ishpeming, Marquette iron range, was elected vice president.

John A. Johnson, chief, Accident Prevention & Health Division, Region V, Bureau of Mines, was reelected secretary.

A. J. Windl, accountant, northern office, Oglebay Norton & Co., Duluth, was renamed treasurer.

T. W. Hill, safety engineer, Cleveland-Cliffs Iron Co., Ishpeming, conducted a "Review of Accidents in the Lake Superior District—1953."

Some 43 companies had industrial exhibits. In addition, five firms had special displays in the hotel lobby.



TRIPLE SUPERPHOSPHATE production at the new plant of Davison Chemical Co. division of W. R. Grace & Co. at Bartow, Fla., is rapidly approaching rated annual capacity of 200,000 tons. Designed by The Dorr Company, the $10.4-million plant began operation last February. Three Dorr processes are used for production of high strength phosphoric acid, evaporation of strong acid and granulation of the final product. In addition, in their first American application, Dorr-Oliver Pan (Giorgini) Filters separate waste gypsum from strong phosphoric acid.

Northwest Guiana Buys Barima Manganese Rights

NORTHWEST GUIANA MINING CO. Ltd., a subsidiary of Union Carbide & Carbon Corp., has made arrangements to purchase Barima Gold Mining Co. Ltd.'s interest in a British Guiana manganese concession. Payment was reported at $625,000. Reserves are said to be between 4-million and 5-million tons of 40% manganese. Barima is to retain its gold concessions. Completion of the transaction reportedly awaited only stockholders' approval.

Milliken Heads Committee

FRANK R. MILLIKEN, vice president, Kennecott Copper Corp., has been named program committee chairman for the American Mining Congress 1954 Metal & Nonmetallic Convention and Exposition to be held in San Francisco's Civic Auditorium, Sept. 20-24.

Appointment of Milliken was announced by Donald H. McLaughlin, president, Homestake Mining Co., Lead, S. D., chairman of the AMC Western Division.

New DMEA Contracts

THIRTY-ONE new contracts providing for exploration for 11 minerals in 11 states were executed by DMEA during the five-months period ending April 30, it was announced last month. Estimated cost of these contracts is $1,420,432 with a maximum Government participation of $939,555. Ten previous contracts were enlarged during this period by amendments which raised estimated project costs by $594,219 and Government participation by $452,318.

Engineers Register Planned

ENGINEERS JOINT COUNCIL in New York will shortly launch a new project to provide a register of 20,000 to 25,000 top men in all branches of engineering. Key men listed, it is felt, would be in a position to name a number of experts in their fields, should they be required for the needs of national defense or for other purposes. According to Paul Lang, EJC assistant secretary, the engineers register should be functioning within a year.

Mining Calendar

American Mining Congress Metal & Non-metallic Mining Convention & Exposition, Sept. 20-24, Civic Auditorium, San Francisco.

AIME Minerals Beneficiation Division, Fall Meeting, Sept. 24, Fairmont Hotel, San Francisco.

AIME Industrial Minerals Division, Fall Meeting, Oct. 5-9, Whiteface Inn, Lake Placid, N. Y.

New Mexico Mining Association and Southwestern International Mining Association, Annual Meeting, Oct. 14-16, Carlsbad, N. M.

Rocky Mountain Region Industrial Minerals Conference, Oct. 28-30, Newhouse Hotel, Salt Lake City.

News Highlights

Withdrawal of 13,000 acres from mineral exploration has brought sharp criticism from the Arizona Small Mine Operators Association. **Page 122.**

A Duluth chemist claims to have perfected a new process for extracting iron from Minnesota's low-grade non-magnetic ores. **Page 132.**

Esmeralda Extraction Co. has purchased more than 2.5-million tons of tailings at the old Miller Mine in Nevada. **Page 136.**

Contracts have been awarded for construction of a $7-million mining and chemical development at Bessemer City, N. Car. **Page 138.**

Hanna Nickel Smelting Co. hoped to have No. 1 furnace at its Nickel Mountain mine and smelter in Oregon in operation early this month. **Page 140.**

Mifflin Mining Co. in Wisconsin is moving its flotation mill 3½-mi, to put all milling operations under one roof at the mine site. **Page 143.**

Quebec Copper Corp. has stepped up its milling rate to 750 tons daily. **Page 144.**

Castle-Trethewey Mines, Ontario's leading silver producer in 1953, has resumed production at its Gowganda Silver Mine following its winter shutdown. **Page 145.**

Union members at Texada Mines Ltd., British Columbia, have by-passed a direct wage increase in order to help their company compete. **Page 147.**

Production is to get underway this month at Sherritt Gordon Ltd's new nickel refinery at Fort Saskatechewan, Alberta. **Page 148.**

A 2-mi conveyor system is being prepared for the Williamson diamond mine in Tanganyika. **Page 157.**

Australia's first private uranium mine already has reached the production stage. **Page 158.**

Montecatini Co. report gives a diverse picture of the mining industry in Italy. **Page 162.**

Norway's newest aluminum plant went into operation in June. **Page 164.**

Picture page of Arizona copper properties. **Page 166.**

Elizalde & Co. reportedly is planning to build a major industrial explosives plant in the Philippines. **Page 168.**

Plans to sell all state-owned mines except the two largest tungsten mines have been announced by Korean officials. **Page 171.**

Additional digests of annual reports. **Page 171.**

Japan's Dowa Mining Co. is watering a "worn out" copper mine—and making money at it. **Page 178.**

Farvalized 48" x 60" Birdsboro-Buchanan crusher in a titanium processing plant.

KEYS TO ADEQUATE LUBRICATION — Wherever you see the Farval valve manifolds, dual lubricant lines and central pumping station, you know a machine is being properly lubricated.

Farval lubrication eases strains on titanium ore crusher bearings

CRUSHING flinty-hard titanium ore imposes such strains on bearings that unless they are lubricated properly at all times costly shutdowns may result.

This crusher keeps busy on titanium-bearing iron ore to produce pigments that give paint a more opaque, better covering quality. To insure that this crusher would stand up well under all load conditions, the builder installed a Farval system of centralized lubrication.

FARVAL is the Dualine system of centralized lubrication that hydraulically delivers oil or grease, exactly measured, to each individual bearing as often as desired. Since Farval lubricates *all* points at fixed intervals with the correct amount of grease *while the crusher is in operation,* there are never any shutdowns for greasing. And since Farval is a self-enclosed system, abrasive dust cannot sift into bearings to cause trouble.

WRITE FOR BULLETIN — Experience shows that Farval saves up to 45 minutes of each hour of oiling labor — up to 3 of every 4 pounds of lubricant used by other methods. Write for Bulletin 26 for a full description of Farval Centralized Lubrication.

The Farval Corporation

3281 EAST 80th STREET • CLEVELAND 4, OHIO

Farval is an affiliate of The Cleveland Worm & Gear Co., Represented in Canada by Peacock Brothers, Limited

IN THE U.S.

ALASKA

Recent DMEA loans were listed as follows: U.S. Tin Corp.'s mine at Lost River on Seward Peninsula, $226,000; DeCoursey Mountain Mining Co. for Red Devil mercury mine at Sleetmute, $88,349; Alaska Copper Corp. for work at the Alaska mine at Port Fidalgo, $112,548; I. W. Purkey for exploration of placer tin on Tozimoran Creek near Tanana, $18,000; Zenda Gold Mining Co. for exploring placer tin near Cape Mt. on Seward Peninsula, $170,000; Alaska Tin Corp., exploration of placer tin at Ear Mountain, near Shishmaref, $18,000; Tillicum Mining Co., exploration at Cape Caamano near Ketchikan, $24,695; Earl R. Pilgrim, exploration at Stampede in the Kantishna area, $62,000; Alaska Metals Mining Co., exploring for tungsten near Fairbanks, $179,234; Alaska Copper Corp., exploring for tungsten near Nome, $41,000; Red Top Mining Co., exploring for mercury at Marsh Mountain near Aleknagik, $25,614; DeCoursey Mountain Mining Co., exploring for mercury at DeCoursey Mountain in the Kuskokwim Valley, $81,000; Admiralty Alaska Gold Mining Co., exploring for nickel-copper-cobalt at Funter Bay, $120,000, and A. L. Howard, platinum exploration at Goodnews Bay, $12,000.

United States Tin Corp. has installed new flotation cells at its Lost River Mill on its property on Seward Peninsula. The 300-ton stockpile of untreated concentrates will be run through together with 3 tons brought in daily from mining and milling of about 150 tons of ore. The additional equipment was required because of the iron, zinc, lead and copper sulphides.

Everett Houghland, formerly of the Republic district in the northern part of Washington State, is manager. The mill at the property was reported to be using only one shift during a water shortage this spring.

DeCoursey Mountain Mining Co. has discovered 2 new ore shoots recently at its Red Devil mine and is progressing with recovery of quicksilver.

A mica deposit near Ketchikan reportedly will be developed by the British Columbia Mica Mining Co.

ARIZONA

Withdrawal of 13,000 acres of Sierra Anche Watershed Experimental Forest near Roosevelt Lake from mineral exploration has drawn sharp criticism from the Arizona Small Mine Operators Assn.

Charles F. Willis, state secretary, protested that it would be impossible to develop any uranium deposits found in the area by leasing if the withdrawal was granted.

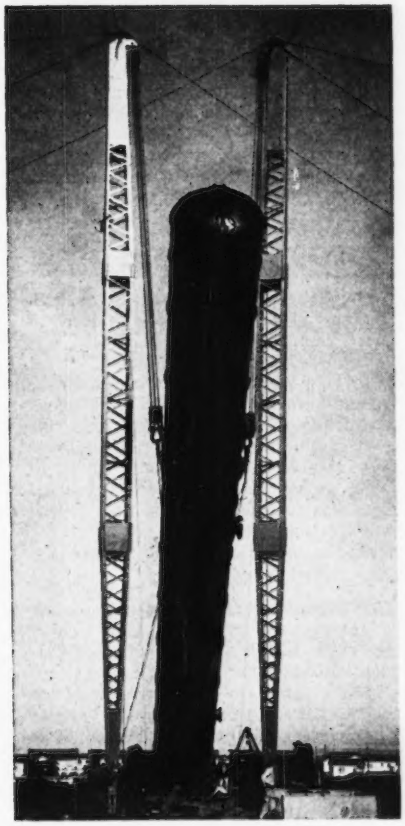
The Forest Service and Salt River Valley Water Users conduct a joint watershed research program on the land.

Willis accused the Forest Service of

Multiple-part Red-Strand Slings are always trusted to handle heavy loads. They are easy to apply to both the load and the crane hook. User tests in Detroit proved Red-Strand slings withstood unusual abuse, yet maintained higher-than-rated strength.

A Gary plant uses Red-Strand single-part slings for many lifting jobs like this. These slings are available with various combinations of end fittings for attaching the sling to rings or lugs. Single-part slings frequently are the most economical to use.

How to Select the Correct Sling for Your Job



A heavy cylindrical load like this usually calls for the use of multiple-part Red-Strand Flat-Laced slings. They are strong, flexible and do not slip or abrade on smooth round surfaces.

Start your sling selection by analyzing five factors:

1. The load—its size, weight, shape, finish.
2. Working area, amount of head room.
3. Size and type of crane hook.
4. Angle of sling legs.
5. Location and type of lugs or rings, if any.

This is basic information. From it, your supplier can recommend the sling by type, size and length that is safest, longest lasting and most economical for your job.

Types of Slings

Multiple-part slings are always recommended for heavy duty service, because for equal strength they are far more flexible than single-part slings. They hug the shape of the load easily, present a greater bearing surface to the load, and reduce the possibility of marring finely finished surfaces.

Where these factors are not so important, either Red-Strand ***single-part slings*** or ***grommet slings*** may be used for economy. Single-part Red-Strand slings are often recommended for lifting lighter weight objects, or those that have fixed attaching rings or lugs. Grommet, or continuous strand Red-Strand slings are ideal for forming hitches of various types without fittings.

How to Gain Extra Savings

Two suggestions will help you save money on slings.

Re-useable Pin-Lock thimbles reduce sling costs by 21%

The first is to re-use Pin-Lock thimbles on multiple part slings. They increase sling life by protecting loops from abuse or damage. Besides, these exclusive Leschen Pin-Lock thimbles cut sling costs on an average of 21% because they may be used again and again. They lock into sling loops with pins instead of permanent clamps, permitting re-use, and eliminating constant expense of thimble replacements.

The second suggestion is to use Red-Strand slings—for a very simple but good reason: Red-Strand slings are made of ***higher-than-rated*** quality Leschen wire rope that delivers ***longer-than-expected*** service.

Get a copy of Leschen's *Sling Handbook* for complete information. Ask your Leschen man for one, or write.

LESCHEN WIRE ROPE DIVISION
The Watson-Stillman Company
(A SUBSIDIARY OF H. K. PORTER COMPANY, INC.)
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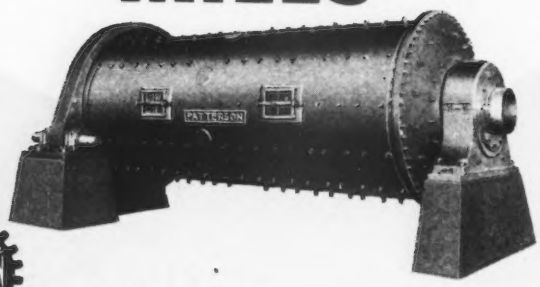
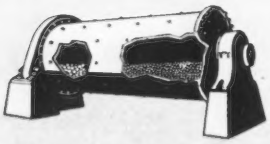
HERCULES Red-Strand
WIRE ROPE

LOW COST CONTINUOUS GRINDING WITH Patterson MILLS



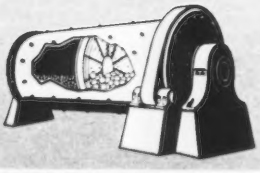
SATISFACTION PATTERSON MACHINERY

These smoothly performing Continuous Mills are most economical and efficient grinders. They are adaptable to fine or coarse grinding . . . wet or dry grinding . . . open or closed circuit grinding. Send for Patterson Catalog No. 534.



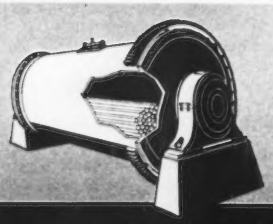
BALL AND TUBE MILLS

Standard Heavy Duty Ball or Tube Mill has replaceable cast alloy iron or steel lining . . . or may be lined with POROX (porcelain) for light duty applications.



COMPARTMENT TUBE MILLS

Separate compartments are charged with different size grinding balls. Compartments operate as several mills in series.



HEAVY DUTY CONTINUOUS ROD MILLS

Particularly desirable when a relatively coarse product with a minimum amount of fines is desired.

Ask for recommendation on the proper mill for your specific need.

The Patterson Foundry and Machine Company
East Liverpool, Ohio, U. S. A.
NEW YORK, BOSTON, BALTIMORE, PHILADELPHIA, PITTSBURGH, DETROIT, CINCINNATI, ATLANTA, CHICAGO, ST. LOUIS, HOUSTON, DENVER, LOS ANGELES, SAN FRANCISCO, SEATTLE
The Patterson Foundry and Machine Company, (Canada) Limited
Toronto, Canada
MONTREAL

Arizona *(Continued)*

conducting a "long-time program to gradually withdraw all forest lands from mineral entry and prohibit mining activities within forest land areas.

"We are quite willing to concede that if it can be shown mining operations will interfere in any way with the co-operative experimental work of the Forest Service and the Water Users, the particular lands involved in such experimental work might well be withdrawn from mineral entry."

"All other lands not so involved should be kept open for utilization for which they are of greatest value—the production of uranium, asbestos, and other strategic minerals," he contended.

Phelps Dodge Corp. has asked for a $20-million reduction on its Arizona property assessed valuation for the coming fiscal year.

Spokesmen noted that mining property is assessed higher than any other class—at 100% of actual valuation as compared with 25 to 30% of value on other real estate. The company request would mean reduction of total assessment from $111-million to $91-million.

CALIFORNIA

Iron Mountain Corp. has purchased 265 acres of land adjoining its heavy copper chemicals and fertilizer plant near Martinez. Purchase price of the property was $158,000, a spokesman said. The firm announced it has no immediate plans for developing the additional land. The company's Iron Mountain Mine in Shasta County formerly produced copper for the Martinez plant, but the property now is being mined for sulphur.

COLORADO

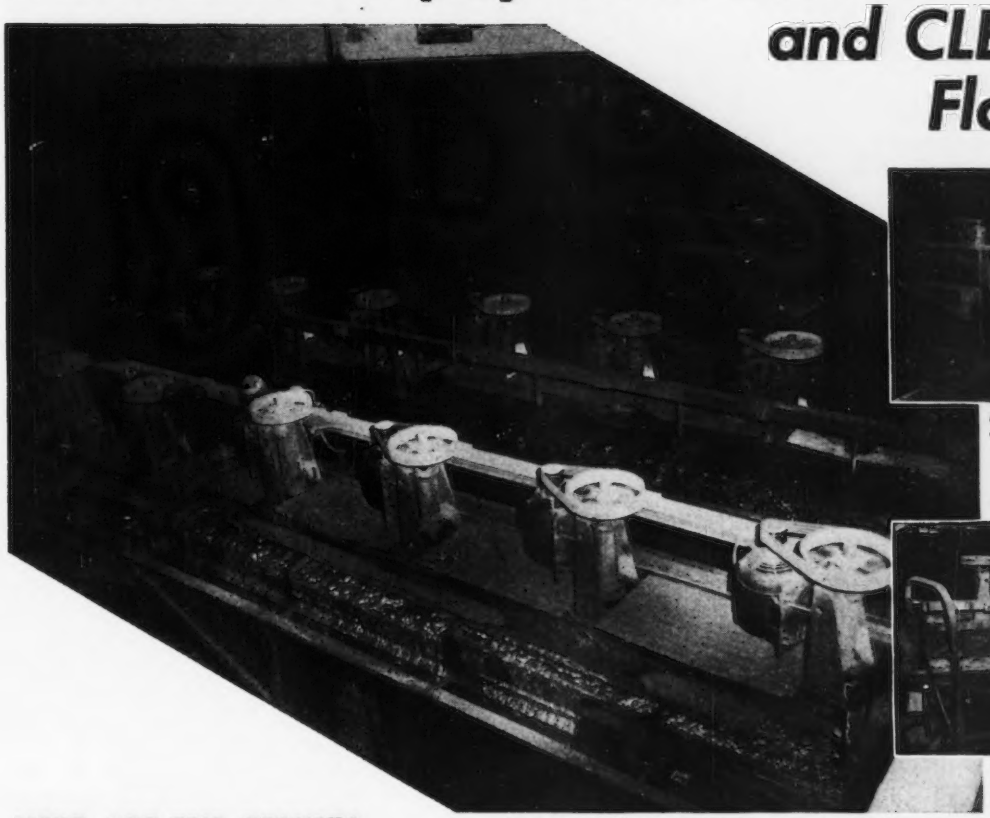
Water has forced postponement of drifting operations on the 2200 ft level of the Cresson Mine at Cripple Creek, 600 ft below the bottom of the shaft.

In view of the fact that the drainage lateral from the Carlton drainage tunnel at 3000 ft depth is to be started in the near future, the purchase of large pumps was considered impractical. The drift being driven was in ore at the time the fault was cut and operations on the level will be started again as soon as the water has been drained off through the deep tunnel lateral.

The nation's biggest tungsten processor is moving into the Sugar Loaf mining district of Boulder County. The Government disclosed that the Wah Chang Corp. of New York has bought for about $50,000 the mill of the former Boulder Tungsten mines Inc., a few miles west of Boulder.

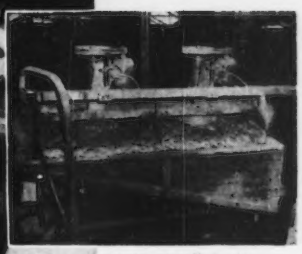
Uranium exploration is underway on the Haskinson claims north of Steamboat Springs near Fish Creek Falls. Work started on a 350-ft tunnel after a new jeep road was constructed to haul in heavy equipment. Superintendent of the job is Art Rudford of Oak Creek.

FAGERGRENS *pay off in both ROUGHER and CLEANER Flotation*



Fagergrens used for rougher flotation by Pend Oreille Mines & Metals Co., Metalline Falls, Wash. Zinc circuit in foreground, lead circuit in center; duplicate circuits being installed in background.

Fagergren cells in lead cleaner flotation circuit.



Fagergren cells in zinc cleaner flotation circuit.

HERE ARE THE RESULTS OBTAINED BY A MAJOR LEAD-ZINC PRODUCER

48 Fagergren Flotation Machines are used by Pend Oreille Mines & Metals Co. in flotation circuits having a capacity of 1600 tons per day. The ore is hard and abrasive with lead (as galena) occurring in coarse crystals and zinc (as sphalerite) finely disseminated in the gangue. Specific gravity of ore is 2.7 to 2.8.

Fagergren's highly efficient performance in this application produces superior metallurgical results, as follows:

1. Lead concentrate grade averaging well over 70% lead.
2. Zinc concentrate grade running close to 60% zinc.
3. Recoveries of approximately 95% lead and zinc in respective concentrates.
4. Exceptionally low lead and zinc tailing assays.

High Metallurgical Efficiency, as demonstrated above, is not unusual with Fagergrens. It is based on the faster rate of flotation and greater flotation recovery made possible by Fagergren's exclusive Rotor-Stator design. This superior agitating mechanism is unmatched for effective pulp circulation and aeration with resulting greater capacity per cubic foot of cell volume and higher mineral recovery.

Specify Fagergrens for your next installation or as replacements for older, less efficient machines. Send today for free copy of Fagergren descriptive bulletin and for recommendations concerning your flotation problem.

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METHOD OF PIPING

FOR GROOVED PIPE

Style 78
VICTAULIC SNAP-JOINT

New, boltless coupling — hand-locks — for faster hook-ups with no loose parts. Ideal for temporary or permanent lines. Sizes 1", 1¼", 2", 3", 4".

Style 77 & 77-D

VICTAULIC COUPLINGS **Style 75**

Style 77 & 77-D—The "general-purpose" couplings for standard applications. Simple, fast, reliable—sizes ¾" to 60".

Style 75—Light Weight Couplings—for low pressure, low external stress applications. Sizes 2", 3", 4".

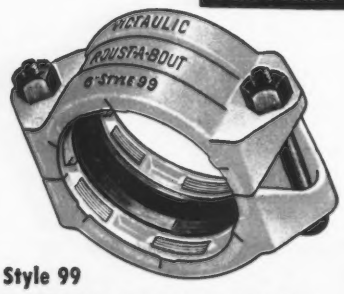
VIC-GROOVER TOOLS

Handy, on-the-job grooving tools that do the work in half the time. Light weight, easy to handle, operate manually or from any power drive. Automatic groove position and depth. Sizes ¾" to 8".

VICTAULIC FULL-FLOW FITTINGS

Streamlined for top efficiency, easy to install—complete line, Elbows, Tees, Reducers, Laterals, etc., — fit all Victaulic Couplings. Sizes ¾" to 12".

FOR PLAIN END PIPE



Style 99
VICTAULIC ROUST-A-BOUT COUPLINGS Best engineered, most useful plain end joint on the market! Simple, fast, husky. Easy to install with any socket wrench. Takes strong, positive, bull-dog grip on pipe. Sizes 2" to 8".

Promptly available from distributor stocks coast-to-coast. Write for NEW Victaulic Catalog and Engineering Manual No. 54-8A.

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EASIEST WAY TO MAKE ENDS MEET!

Colorado *(Continued)*

A new headframe for the Alps Mine at Central City has been installed at this Quartz Hill property, according to General Superintendent Leonard Abbott.

The Alps is just above the Kirk Mine, from which radium came for experiments 50 years ago. Atomic Uranium Corp., present operators of the mine, are after uranium.

Less than 1000 ft west, the same crew which operates the Alps has installed a new compressor at the German Mine, and is now laying pipe for air to operate the machines in the drifts below. The German is operated by the Intercounty Corp., closely allied with the Atomic Uranium Corp.

Trail Mines reports Cripple Creek operations are centered around the running of the raise at the northeast end of the stope on 600-ft level of the Cresson property, where it has a lease.

The work is going forward in pay values.

There are approximately 800 tons of broken ore in the stope. The last car of screenings shipped to the mill settled for $50 in gold to the ton. John Phipps is superintendent.

At Breckenridge, the lead mine operated last year by James P. Webb and Melvin Gaymon on the Pittsburgh Gulch has been reopened.

Several men have been hired and the shaft started last year will be sunk 60 ft and then a drift run under the ore. Several cars of high grade ore were shipped last year from surface operations with a power shovel and then the shaft was started late in the year.

Pumping to lower the water level in the Carroll Mine in Gilpin County just below the 200-ft level allowed crews entrance to the 60-year-old drift.

Leached out samples of ore indicate to the management that radioactive ores in the old mine, now being reopened by United Mining & Leasing Corp. should be even better than they had expected from previous geiger counter readings.

According to Claude R. McKay, manager of the organization at Central City, the company will be shipping ore within the next two to three months.

IDAHO

Bunker Hill & Sullivan Mining & Concentrating Co. has completed deepening the three-compartment shaft at its Crescent property in the Silver Belt of the Coeur d'Alene District from the 1200 to the 3200 ft level.

The project, started on June 24, 1953, and pushed by three crews working around the clock six days a week, was completed in 11 months, breaking all previous shaft-sinking records for the District.

During the latter months an average advance of more than 9 ft per day was attained. Overall average exceeded 8 ft per day.

Shaft was bottomed at the 3275-ft level, more than 500 ft below sea-level,

JOY SHEAVE BLOCKS ARE BUILT TO YOUR SPECIFICATIONS!

SWIVEL HOOK

SAFETY HOOK

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HERE'S HOW THEY'LL SIMPLIFY YOUR SCRAPING JOB

Joy Tail Rope Sheave Blocks were developed *in the mines,* by mining men—specifically for the rugged job of scraper loading.

Every design detail has been thrashed out, in service, to give real "bug-free" operation. For example:

- Extra wide sheave wheels reduce rope wear.
- Quick-opening snatch blocks allow fast, easy rope changes.
- Large throat openings and flared side plates will actually pass knots tied in *wire rope.*
- Sealed-for-life bearings are watertight, dust-tight, and require *no lubrication.*
- Tough alloy steel is used for side covers, wheels, hooks, eyelets and clevises.
- All steel construction—can be picked up by magnets if lost in a load.

A Joy Sheave Block is a stout, durable piece of equipment that requires practically *no attention.* It's just the ticket for hard-to-reach-to-service jobs. ● Get the full story today—write for Bulletin 76-D. ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

QUICK-OPENING SNATCH BLOCK CONSTRUCTION

Opened block showing milled slot. Pin removed.

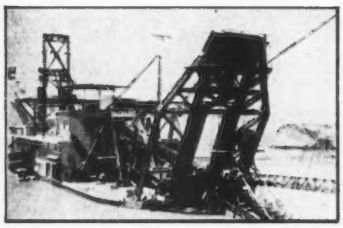
Block closed, pin in place, locking key in "Open" position.

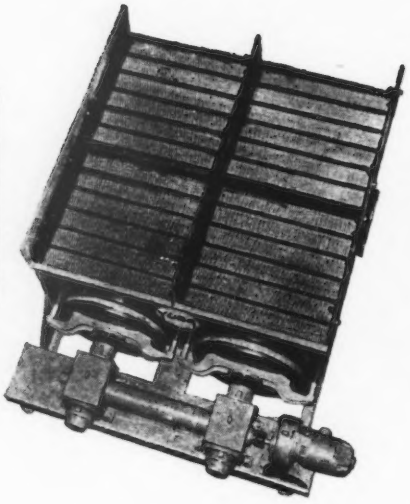
Block closed, pin in place, key in "locked" position.

JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

W&D M4666B





M-8 jig developed by YUBA for concentrating ores on dredges and in mills. It's designed to save space, reduce downtime, increase production.

FULL AREA OF

YUBA JIG BED

IS COMPLETELY ACTIVATED

YUBA jig action is positive. You set the speed and stroke wanted, get constant, even pulsations that create surface action over full area of bed. Result: YUBA M-8 jigs have a large material capacity per flow line under full control.

Any material that can be concentrated can be handled successfully in YUBA jigs, including . . .

CASSITERITE	RUTILE
GOLD	SCHEELITE
PLATINUM, ETC.	GARNETS
MONAZITE	SAPPHIRES
ZIRCONIUM	IRON
ILMENITE	COPPER

Design Eliminates Trouble Spots

Stainless steel hutch valves and screens prevent rusting and clogging. Rubber seal between screen grids and basket confines action to screen area. Long-wearing hutch diaphragms of reinforced synthetic rubber can be replaced easily.

"Package Drive" units for YUBA jigs are interchangeable, completely enclosed, self-lubricating. Generous use of anti-friction bearings reduces power required. Maximum frequency of a 4-cell M-8 jig is 350 at ¼". Stroke adjustments between ¼" minimum and 3" maximum are easily and quickly made, enabling you to closely control jig action.

YUBA jigs can be installed in new or old dredges or mills to supplement existing jigs or to replace other concentration methods. Send us data on ore, feed sizes and present installation if you wish us to furnish details to adapt YUBA jigs to your operation.

71

YUBA DREDGES — PROVED DEPENDABILITY AROUND THE WORLD

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Idaho *(Continued)*

providing sump and pocket room for a 3200 level from which to explore and develop the property.

The Crescent project is being done under the biggest DMEA program ever approved in the Coeur d'Alene District. It involves a total expenditure of $1,098,750, half of which will be put up by the DMEA on a loan basis, to be repaid on a royalty basis from any production which may result from the exploration work.

Polaris Mining Co. is developing a good new orebody on the new 3200-ft level in the New Purim area which adjoins Polaris' Silver Summit Mine on the west in the Silver Belt of the Coeur d'Alene District.

A 500-ft west drift on the vein exposed over 370 ft of commercial grade ore, and the west limit of the ore zone had not yet been reached. Raise work to determine the upward extent of the ore shoot is in progress, and the 3400 Silver Summit level is being extended westerly to probe for the downward projection of the ore.

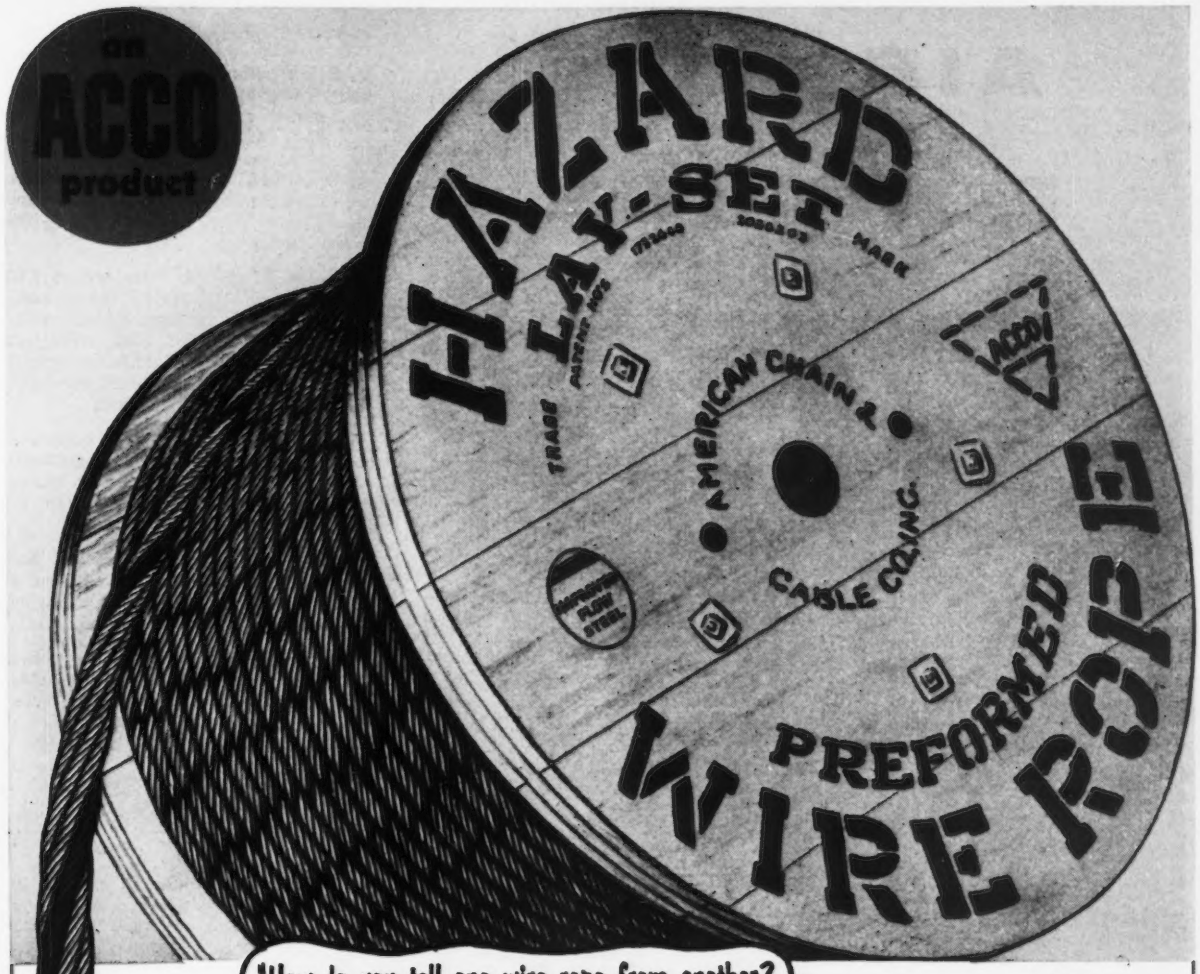
Ore occurs along the hanging wall of a wide vein structure, which on the 3000-ft level had its best mineralization on the footwall side. Company geologists now believe there are two ore structures coursing through the area, roughly parallel and about 20 ft apart. New Purim area is being developed by Polaris and Silver Dollar Mining Companies under a profit-sharing agreement, with Lincoln and Hayden Hill Consolidated mining companies holding royalty interests by virtue of properties leased to Silver Dollar.

Shaft-sinking at the Vindicator Silver-Lead Co. property east of Mullan in the Coeur d'Alene District is progressing at the rate of about 120 ft a month and is expected to reach its 800-ft depth objective sometime in November. The two-compartment shaft, which will provide access for deep exploration of the Vindicator vein, is being financed by Silver Buckle Mining Co. under a 50-50 profit-sharing agreement, with 50% federal aid from DMEA.

Silver Star-Queens Mines Inc. reportedly has decided to request additional DMEA assistance to continue exploration at its Minnie Moore-Queen of the Hills operation near Bellevue in Blaine County. Last January, the firm completed a $136,887 DMEA project which showed promising results. In addition to new exploration, construction of a 100-ton mill is planned.

Polaris Mining Co.'s East Exploration project from the 3000-ft level of Silver Summit Mine in the Silver Belt of the Coeur d'Alene District has opened an interesting zone of silver-copper (tetrahedrite) mineralization in American Silver Mining Co. property.

Idaho Custer Mines Inc. has resumed work, after a brief winter shutdown, at its Livingston property in Custer County. The firm expects to begin immediately on the first phase of the $97,738 DMEA project approved last year.



"How do you tell one wire rope from another? They all look the same to me."

"It's not easy, but during the 15 years I've been using wire rope I've learned this: Pick a good brand and stick to it. We decided on HAZARD Lay-Set Preformed which has a green strand for quick identification. HAZARD makes a complete line and their recommendation book tells us the constructions that will give us the best service. "HAZARD has good distributors wherever we operate and we can pick up what we need in a hurry."

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Idaho *(Continued)*

U. & I. Uranium Inc., of Kellogg, operating company for six Kellogg firms, has started exploratory drilling on its Hot Rock and Radon properties in the Big Indian Wash area of San Juan County, Utah. Sharing equally in the venture are Caledonia Silver-Lead, Coeur d'Alene Silver Giant, Nancy Lee, New Era, Silver Bowl and Signal.

Whitedelf Mining & Development Co. has contracted with DMEA for an additional $69,000 to continue exploration at its property near Clark Fork. New pact provides for 1500 ft of additional exploration to probe the downward extension of orebodies south of the shaft.

New Rainbow Mining Co. has exposed about 60 ft of ore in gold-silver and lead-zinc values in old workings at the Weber property in the Lakeview District of Bonner County.

Hypotheek Mining & Milling Co. has begun test drilling for uranium on a 10-claim property in the upper Coyote Wash area of San Juan County, Utah.

Twin Rivers Inc., Riggers placer firm, has installed a new, 135-ton portable dredge and washing plant at the Golden Rule placers on Grouse Creek in the Warren Mining District of Idaho County. Plant will handle up to 250 yd of gravel per hour.

MICHIGAN

Book Mine near Alpha of the North Range Mining Co. was reopened May 17 on a four days per week basis with the expectation of a five day week "as soon as possible."

The Book had been closed down for about 3½ months. With its reopening, the mine will operate the first iron ore concentrating plant on the Menominee range. This washing plant has been under construction for some months. About 70 men were recalled to their jobs.

The new Lawrence Mine of Pickands, Mather & Co., near Crystal Falls, was closed May 20 for an indefinite period. About 73 men were laid off. Pumping will be continued and watchmen will be kept at the property, but some of the other mining equipment is being removed.

Inland Steel Co., which operates the Sherwood and Bristol mines on the Menominee range, expects no change in their present five day week schedule according to Ray Satterley, Ishpeming, general superintendent.

Cleveland-Cliffs Iron Co. in its decision to reduce working forces 25% by May 15, did not include the Spies Mine at Iron River or the Cliffs Shaft mine at Ishpeming. Mines affected are the Mather, Lloyd, Maas, Cambria, Bunker Hill and the general storehouses and shops.

Spring technical meeting of the Upper Peninsular Section of the AIME was held in Houghton in May. Features of the new Cannon mine of the M. A. Han-

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Michigan *(Continued)*

na Co. were discussed by Jack Morrow, chief mining engineer for the company in the Michigan District.

Peter Torreano, superintendent of Pickands, Mather & Co.'s Peterson Mine at Bessemer, told of the new features at this property. Among other highlights were a paper on the "Airfall Mill as a Crushing Medium for Lake Superior Native Copper Ores," by George Craig, research director of the Calumet Division of Calumet & Hecla, Inc. and a full color sound movie of the "Unwatering of the Osceola Lode" with R. J. Marcotte, quality control manager.

MINNESOTA

A Duluth chemist, Enoch F. Edwards, claims to have perfected a new process for extracting iron from Minnesota's low grade non-magnetic ores. His process uses peat as a fuel and does not require large quantities of water. Its development, to date, has been confined to laboratory experimental work and has not been tested in a larger pilot plant.

Arrowhead Constructors has been awarded a contract by Erie Mining Co. for 70 mi of railroad. It will run from Erie's taconite processing plant at Aurora to Lake Superior. In addition, the Dravo Co. of Pittsburgh has received a contract for building breakwaters and docks at Taconite Harbor, 81 mi northeast of Duluth.

The report of Itasca County mine inspector, J. A. Beecroft, for 1953 shows both total ore shipped and cubic yards of stripping removed as being higher than in 1952. 16,241,437 tons of iron ore was shipped—more than 3½-million tons over 1952. Of this total amount, only 155,250 tons came from underground mines; the balance from open pits.

Two underground mines, the Bennett (Pickands, Mather & Co.) and the Sargent (Cleveland-Cliffs Iron Co.) were exhausted during the year. Only 61 men were employed underground out of a total of 4706 mine employees.

The 38,105,264 cu yds of stripping removed in 1953 was 4,328,831 yds more than in 1952. Out of a total 77 mines in the country, 50 were operated during the year and 27 were idle. There were three fatal and 106 non-fatal accidents during 1953 with a total manhours worked of 9,700,304.

At a meeting of the Mining Sub Section of the Minnesota Section of the AIME in Hibbing June 2, Edward Schmid, of Reserve Mining Co., gave a talk on "Progress on Taconite."

M. A. Hanna Co.'s new Yawkey Mine, near Crosby on the Cuyuna Range, has entered the shipping list for its first season.

Plant construction at the Morton Mine of the M. A. Hanna Co. is progressing rapidly. The dragline-conveyor stripping system at the Morton began operating

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Minnesota *(Continued)*

for the season on April 23, on a 21 shift per week basis. Most mines on the Mesabi Range are now operating five days per week. The 1490-ft overall length, three stage, 30-in. conveyor belt with a vertical lift of 396 ft, installed by Pickands, Mather & Co. at its Mahnomen mine last year, is now in operation. The Mahnomen shipped its first ore in 1916. It is one of the oldest operating mines on the Cuyuna. Among the few that are older are the Armour No. 1 and No. 2 and the Pennington.

Jones & Laughlin Steel Corp. has optioned an iron ore property near Kirkland Lake, Ontario, from Gulf Oil Corp. J&L is allowed two years in which to explore the property which may contain as much as 150-million tons of crude magnetic taconite mineable by open pit methods. Kirkland Lake is approximately 350 mi northwest of Toronto and about 100 mi west of Noranda.

MONTANA

Minerals Engineering Inc. continued open-pit operations at its Brown's Lake tungsten property in Beaver County throughout the winter, despite temperatures as low as 25 deg below zero. Nine men kept its new mill at Glen fed with sufficient ore for 350-ton-per-day operation, seven days a week. Summer plans include stripping limestone overburden from a new area and expansion of production to 400 tons a day.

NEVADA

Newly organized American Western Exploration Co. has purchased the Marshall copper mine at Contact. The firm plans to do extensive diamond drilling and sink a winze in line with its goal of stepping up production from the present 450 tons a month to 1000 tons a month.

Plans call for exploration below the 110 level, entered through an adit. Present workings extend 450 ft above the 110 level. About $19,000 is left of a DMEA contract obtained by the Marshall family, previous owners.

In 1953 more than 5300 tons of ore were shipped from the mine to American Smelting & Refining's Garfield smelter. Jacob Porter, project engineer for the new company, estimates that continuation of about 650 ft on the main vein should block out some 40,000 tons of ore. The ore reportedly has been averaging about 5% copper, with small amounts of gold and silver.

American Western Exploration also is negotiating with owners of three other copper mining properties in the Contact area, according to Murray A. Schutz, president. Schutz said the company plans to prospect for uranium in Utah and Nevada, and negotiations for purchase of several uranium prospects in northeastern Nevada are under way.

Jack Peters has completed erection of his tungsten mill and has begun opera-

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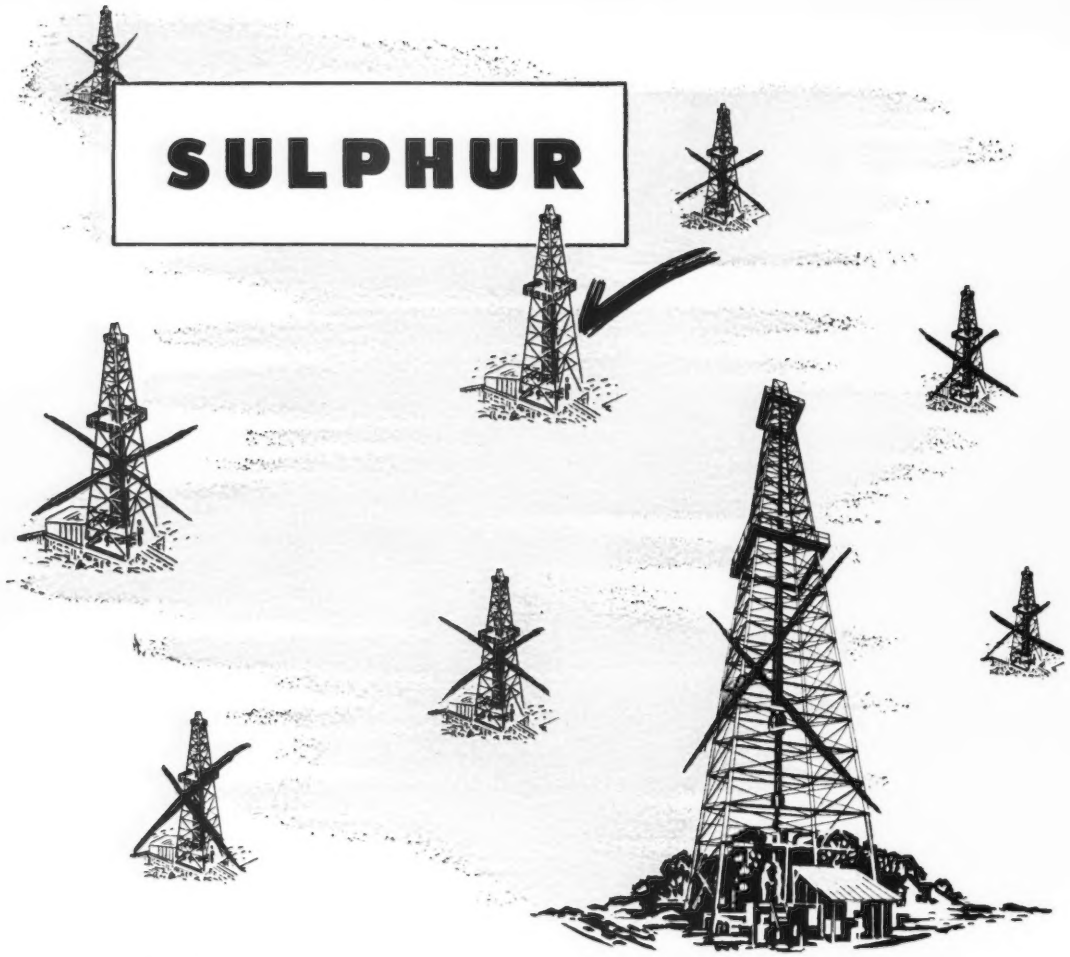

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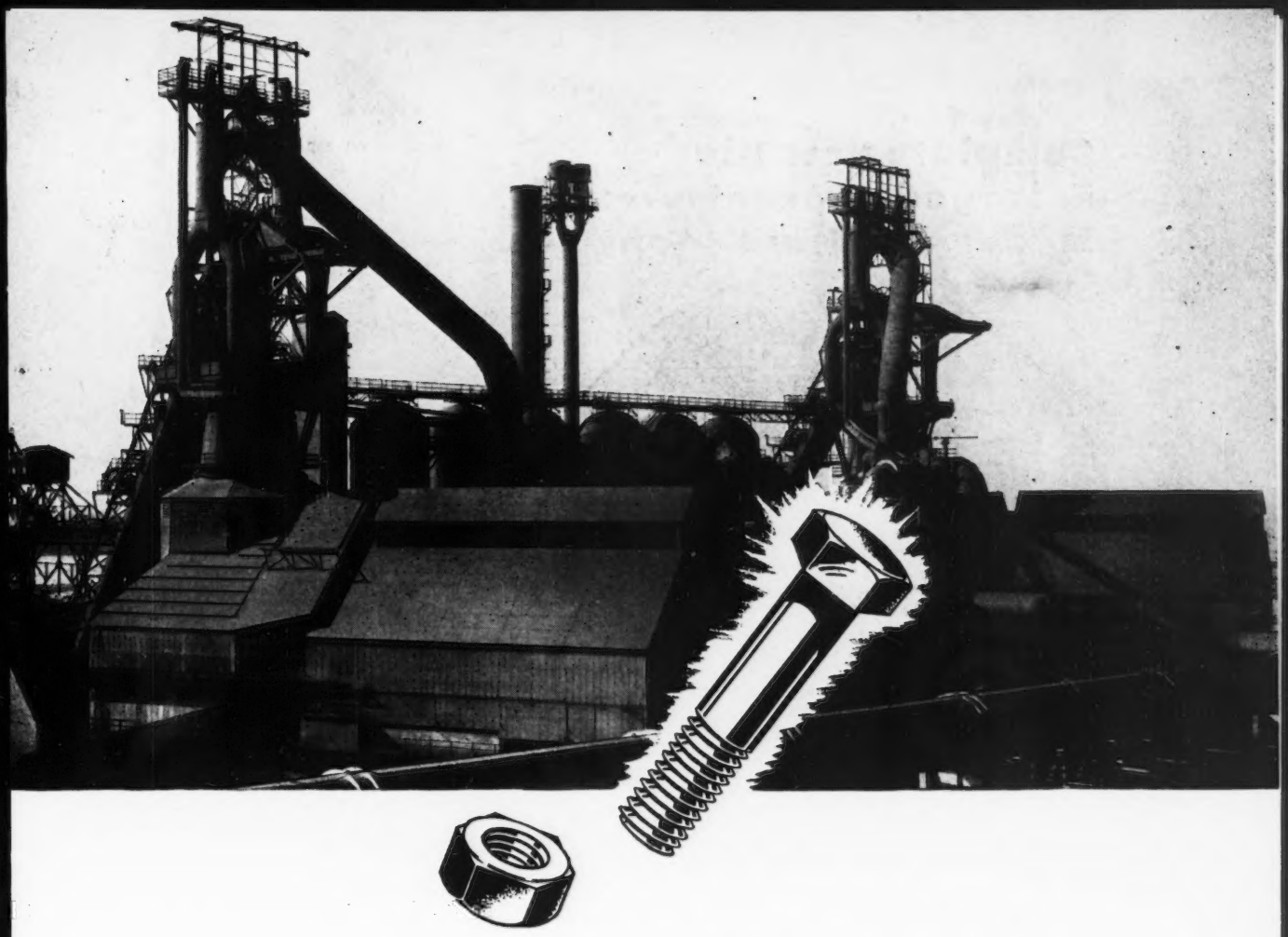

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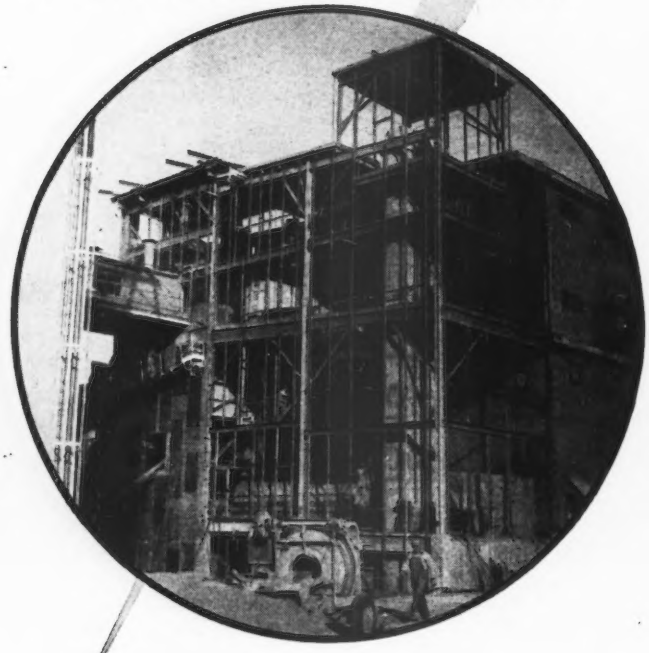

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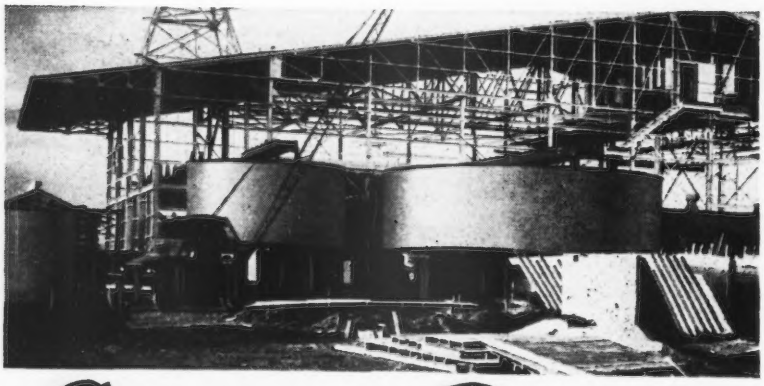

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Nevada *(Continued)*

tions on the Carver property in Nye County, and scheelite mining is continuing at an active rate in the Ophir Canyon district nearby.

Early & Stokes, operators of the Ophir Canyon property, had been shipping their ore to the U. S. Vanadium mill near Bishop, but are now using the Peters mill. Several people have shown interest in leasing tungsten properties in the nearby Toiyabe district as a result of the new mill erection.

Fluorspar ore is now being shipped from the Charles Cirac Mine in Cox Canyon in Churchill County to the Kaiser Aluminum and Chemical Co. mill at Fallon.

C. J. Brackney and Jim Ryan, both of Fallon, are operating the mine, and have put in an ore chute from the tunnel level. The tunnel is now in 500 ft, and plans call for stoping as well as a winze.

It is estimated that the mine will yield from 125,000 to 150,000 tons of mill-grade fluorspar ore.

High grade fluorspar ore was shipped from the same mine before the war, but the property closed down when the Navy took over the area for gunnery practice.

Esmeralda Extraction Co. has purchased more than 2.5-million tons of tailings at the old Miller Mine site near Tonopah and will start working them in the near future. Engineer in charge will be A. E. Place, of Boulder City, who has recently been engaged in mining in Chihuahua, Mexico. Charles H. Chandler, of Boston, heads the new corporation.

The tailings were left by the treatment plants of the Tonopah Mining Co. and the Tonopah Belmont Co. which operated between 1905 and 1930. Extensive metallurgical tests have shown that a profit can be made by recovering gold, silver and tungsten valves through modern methods. Chandler, who has been working tailings from the Quartette Mine at Searchlight, interested a group of Coos Bay, Ore., men in taking over the Miller tailings and setting up a processing plant. Ira Jacobson, of Tonopah, is head of the group.

A pilot plant has been set up to test recovery processes. When tests are complete it is planned to erect a 500-ton mill on the site, which will be used for commercial operations.

American Sulphur & Refining Corp., of Los Angeles, has been given the contract to build a $200,000 sulphur refinery near Winnemucca in Humboldt County for the Continental Sulphur and Phosphate Corp. of Dallas. Construction is expected to be completed late this summer. Capacity of the new plant will be from 50 to 75 tons daily. Rail trackage already has been laid to the mill site at Sulphur where Continental has large sulphur holdings.

Eagle-Picher Co. diatomaceous earth refining plant at Clark Station east of Reno is now employing 45 men and operating around the clock five days a week. It produces all the diatomaceous earth sold by Eagle-Picher. John Kenny is plant superintendent, and Milton Steinheimer is

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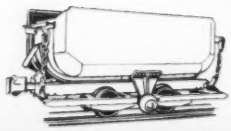

C.S. Card Iron Works Co.

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Nevada *(Continued)*

mining engineer. The plant is supplied from Eagle-Picher Co.'s large deposits just south of Clark Station.

Atlanta Gold & Uranium Co. is shipping 100 to 150 tons of ore per day from its Atlanta mining property in northeastern Lincoln County.

A mill now at the Adelaide Crown Mine near Golconda in Humboldt County has been purchased and will be moved to the Atlanta site and erected. Roy A. Hardy, owner of the mill, is also interested in Atlanta Gold and Uranium Co. Bob Wilkins and Rodney Truman, of Pioche, have the contract for mining the ore, and are employing 12 men.

Nevada Scheelite mine, in northern Mineral County, is employing 115 men and preparation is now underway to sink a winze from the 400 to the 500 level. E. M. Colwell is general manager at the mine and mill.

Mining has been in progress from the 300-ft level, but much ore has also been coming from the 400-ft level. Production has been increased from 2500 units per month to 3000, and the mill which previously was handling 90 tons per day is now up to 120 tons. Nevada Scheelite is a division of the well-known Kennametal, Inc.

NEW MEXICO

Illinois Zinc Co. reportedly is planning to resume production at its Kearney zinc mine near Silver City. This property has been shut down since January 1953.

Morris Blumberg, Illinois Zinc chairman, commented that the resumption is being undertaken because of the improved price of zinc. When the mine closed last year, it had been producing at a rate of about 880 tons monthly of zinc concentrate, or approximately 500 tons of refined zinc.

Illinois Zinc also is preparing to develop the old Shannon Mine in Arizona as a lead-zinc orebody. Formerly, the Shannon operated as a copper property. The Shannon is about 16 mi from Tombstone.

NORTH CAROLINA

Contracts were awarded June 11 for construction of a $7-million mining and chemical development at Bessemer City for the Lithium Corporation of America, which will employ about 100 workers.

The corporation in announcing the contract said that it hopes to get the plant into operation by Dec. 1. It withheld comment on mineral and chemical products which will be produced. Previous reports stated that the large deposits of spodumene in the area will be involved in the operations. Mining operations will be centralized about 10 mi from the plant. Crude ore will be transported by truck to the plant for processing.

Some of Codell's crews work against a backdrop of steel construction as wagon and hand drills bite into the limestone. The Bethlehem Hollow was furnished by Contractors Service and Supply Co., Winchester, Ky.

3½ Million Cu Yd Excavated For G. E.'s Appliance Park

A huge manufacturing plant, in itself a major industrial center, is nearing completion under the supervision of General Electric Realty Corp. at Buechel, Ky., southeast of Louisville. Called Appliance Park, it is dominated by five main plant buildings, and will be operated by General Electric Company for the manufacture of major appliances.

Clearing and leveling the sloping 1000-acre site upon which Appliance Park is situated was no easy task, for it called for the removal of 3½ million cu yd, a portion of which was hard limestone.

This phase of the job was handled by Codell Construction Co., Winchester, Ky. Codell used Multi-Use steel bits on rods of 1 in. and 1¼ in. Bethlehem Hollow Drill Steel, and drilled blast holes ranging in depth from 2 ft to 20 ft. Bethlehem Hollow was used exclusively in this important construction project.

Left to right: W. F. Conlin, *project manager,* Turner-Struck Construction Co., *general contractor;* D. K. Shore, Bethlehem Steel Co.; Geo. M. Eady, *president,* Geo. M. Eady Construction Co., *utilities contractor;* W. O. Billiter, *superintendent,* Codell Construction Co.

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OREGON

James Muir, Don Olling and Verne Jacobson, all of Baker County have completed a working agreement with William Wendt for development of the Sanger gold mine in that eastern Oregon county.

The group, currently readying the property for operation, plans to mine and mill ore from a shoot on a new vein prospected by Wendt a few years ago. They contemplate additional prospecting of the property where Wendt, owner of the land, also owns a 5-ton test mill erected last summer. This includes an Ellis mill, plate amalgamation and a Wilfley table. Tailings will be impounded for future cyaniding.

Mining property operators on federal tracts supervised by the U. S. Bureau of Land Management in Area 1, states of Washington, Oregon and California are advised to note a new address for the Area 1 office in the new Interior Bldg. at 1001 N. E. Lloyd Blvd., Portland, 14. Oregon Land office and Public Survey records for Oregon under the bureau will be located at 827 N. E. Oregon St., a building formerly occupied by Interior's Bonneville Power Administration. Proofs of labor for assessment on mining claims on Oregon California Revested land tracts should be sent to the new land office address.

Oregon Department of Geology & Mineral Industries reports that chrome ore from Seldovia Chrome Co., Seldovia, Alaska, is being received at the government purchasing depot at Grants Pass. Information indicated the Seldovia operation is aiming for 30 tons per day by July and 5000 tons this year.

Hanna Nickel Smelting Co. Inc. hoped to have No. 1 furnace at its Nickel Mountain mine and smelter at Riddle in operation by early July—perhaps earlier—and the second by Oct. 1.

This was reported by Earl S. Mollard, general manager for Hanna at the $25-million plant, when company officials and Bonneville Power Administration and California Oregon Power Co. met in May to conclude power contract arrangements. The agreement calls for 65,000 kw of firm energy, the last allotment of U. S. Columbia River system generation reserved for defense production in the Pacific Northwest.

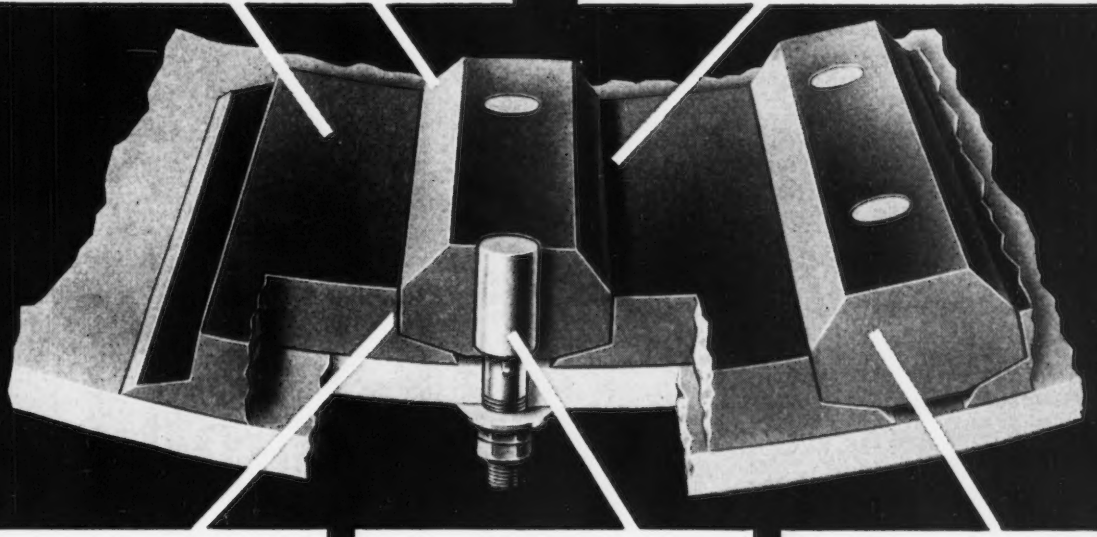
Hanna officials from parent and subsidiary firms were on hand to report progress of the work which represents the nation's major endeavor to stockpile ferronickel from domestic ores. The power contract is for a 5-yr period, length of the DMPA contract with Hanna, but there is ample ore in prospect for perhaps a 30-yr operation. Initial power delivery under BPA's development clause was due in June.

WASHINGTON

About 242 employees of Northwest Magnesite Co., Chewelah, have voted for representation by the United Steelworkers of America (CIO) in an election sponsored by the NLRB.

Plates are interchangeable. Localized wear may be compensated for by heat treating.

Plates made to accurate size, in easy-to-handle sections . . . go in faster.



Accurate fit of lift bars and tight joints eliminates shell wash and allied troubles.

Support for bolt head located near bottom of bar . . . bolts effective for life of lining.

Lift bars designed for correct cascade action. Height of lift varied to suit conditions.

A money-saver in any type mill . . .

USS LORAIN ROLLED PLATE LININGS

● No matter what type of grinding mill you operate, it will pay you to take a look at these cost-cutting advantages of USS Lorain Rolled Plate Linings:

You save on installation time and labor. Lorain Liner Plates can be installed quickly, easily . . . they are made to accurate size and in easily-handled sections.

You save valuable grinding space. The great strength and abrasion-resisting qualities of the rolled steel from which Lorain Plate Linings are made, safely permit the use of reduced thickness. This means an increased usable diameter, increased output for your mill.

You save "down-time" for repairs. Costly mill repairs are reduced with Lorain Plate Linings because the tight fit between ends of plates and between plates and lift bars eliminates shell wash and associated troubles.

You save on replacement materials. USS Lorain Rolled Plate Linings last longer. And severe localized wear at feed or discharge ends can be compensated for simply by reversing the worn plates at opposite ends. You get full-life use from your Lorain Plate Linings.

There are USS Lorain Rolled Plate Linings to fit any type of mill —for wet or dry grinding. They are available through leading mill manufacturers whose names will be furnished upon request.

USS Grinding Balls offer dependable, economical grinding action

Production of USS Grinding Balls is carefully controlled to assure uniformity, surface hardness and maximum hardness penetration. They are available in diameters from 3/4" to 5". Mail the coupon below for our free booklet on USS Grinding Balls.

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Without obligation on my part, please send me your FREE booklet on USS Grinding Balls.

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USS LORAIN ROLLED PLATE LININGS AND USS GRINDING BALLS

4-814

UNITED STATES STEEL

NYLON in the U. S. Royal Con-Trak-Tor helps you through the heavy going—*keeps you on schedule!*

ALL-NYLON STRENGTH

The Con-Trak-Tor's Nylon cord body withstands murderous impact . . . means that you get every hour of tire life built into this great U. S. Royal tire.

TRIPLE IMPACT PROTECTION

The Con-Trak-Tor's built with extra rubber between cord-plies—double shock-pads beneath the tread—tough rock-resisting construction at the crown.

FULL LUG TRACTION

The Con-Trak-Tor's full-width lug design digs deeper, pulls harder in forward or reverse—actually works where other tires stall.

Prove it. Put the Nylon U. S. Royal Con-Trak-Tor to work—watch your pay loads stay on the move. Your U. S. Royal Dealer has it in your size, for your job.

NYLON...Keeps Pay Loads Moving!

U.S. ROYAL

CON-TRAK-TOR
FULL LUG

US RUBBER UNITED STATES RUBBER COMPANY

Washington *(Continued)*

The vote ended, by a 2 to 1 majority, representation by the International Union of Mine, Mill & Smelter Workers (Ind.) which had represented the workers since 1942.

The CIO union had petitioned for the election to which the mine-mill union agreed. The mine-mill union's contract with the company expired June 30. The company employs 340 men but all did not vote.

Grandview Mines, under a $36,400 DMEA exploration contract, has resumed diamond drilling exploration at the Dosser-Maki-Lotz property southeast of Deep Lake in Stevens County. A crew is sinking a vertical hole north of the last row of holes in order to test the iron bearing deposit at greater depth, Karl W. Jasper, president, reported.

WISCONSIN

Mifflin Mining Co. is moving its flotation mill from its present site at the edge of Mifflin, Iowa County, to the site of its Cokerville Mine and jig mill, a distance of 3½ mi. The new set-up will put all milling operations under one roof at the mine site.

First milling will be done on ore already on the surface—some mined ore which has been stockpiled, and some fines which were impossible to recover with insufficient equipment in their earlier operation. Later milling will be done on ore from the Cokerville Mine (New Jersey Zinc Co.) where it is estimated there remain 400,000 tons of ore averaging more than 5% zinc as sulfide with minor amounts of galena. It is planned to mine 250 tons per day to furnish a ball mill feed of 140 tons per day.

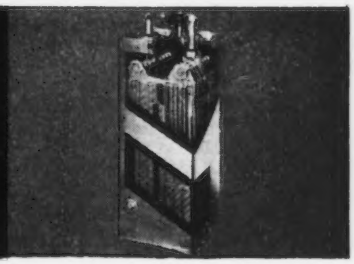
Ore will be trucked from the mine through an inclined adit to a 30 in. x 42 in. Universal jaw crusher where it will be reduced to a maximum 4 in. product and conveyed to a 185-ton hopper. This hopper will feed to a 8 in. x 36 in. Universal jaw crusher where it will be further reduced to maximum 1 in.

It will then be sent to a 5/8 in. trommel screen in closed circuit with a 30 in. x 15 in. set of rolls and the undersize will be fed by an Eagle 18 ft classifier to the jigs. One cell of the 5-cell 36 in. x 48 in. Hartz-type steel jig is to be used to produce lead and the hutch product from this cell will be pumped to a 2-cell Denver mineral jig for final cleaning. The other four cells of the jig will produce a tailing which will be discarded and a partial concentrate to which will be added the tailing from the mineral jig. This latter will be pumped to a 22 ft Eagle classifier, dewatered, and stored in a 100-ton smittem bin from which it will be conveyor-fed to the ball mill.

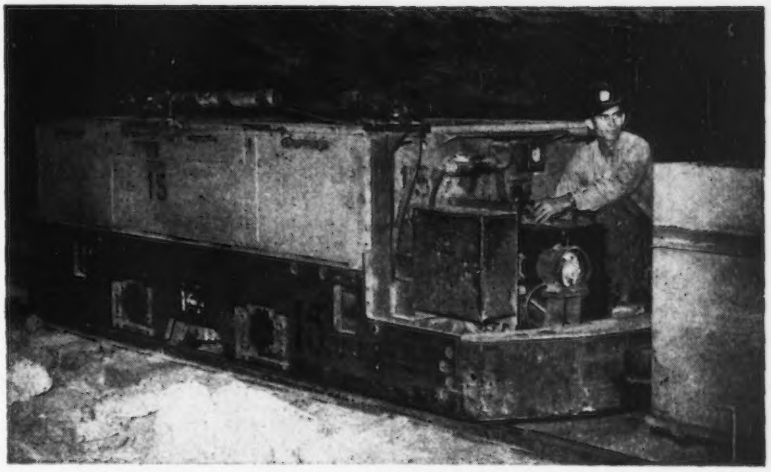
Overflow from this classifier will go to an 8000 gal tank from which the fines will be added to the ball mill discharge. The water overflowing this tank will be stored for reuse.

The 6 ft x 28 in Hardinge type conical ball mill is being set up in closed

battery power



at the lowest over-all cost!



Steel cell construction, and a completely reversible chemical reaction make the EDISON battery the most rugged battery available for mine locomotive service. But, besides this rugged construction, EDISON batteries employ an alkaline electrolyte that preserves battery plates . . . and insures electrical function that's free from self-destruction. All of this means the longest battery life possible at the lowest over-all cost!

Failure-free, uninterrupted power is the consistent record EDISON batteries have turned in at countless mine operations. Since they do not need critical charge-rate adjustment, EDISON Batteries can be often charged directly from d-c lines. They consistently withstand the irregular charging characteristics of combination locomotives . . . are not harmed by accidental short-circuiting or reverse charging . . . by standing idle during shutdowns or by freezing temperatures. And, EDISON batteries can be fully recharged in six to seven hours.

For the most dependable battery power in your mining operations, be sure to ask for all of the facts and latest quotations on EDISON batteries now. To request an EDISON field engineer's call or a copy of Bulletin 3826, simply write Edison Storage Battery Division, Thomas A. Edison, Incorporated, West Orange, N. J.

Most dependable power... lowest over-all cost you get both with an EDISON

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Nickel • Iron • Alkaline
STORAGE BATTERIES

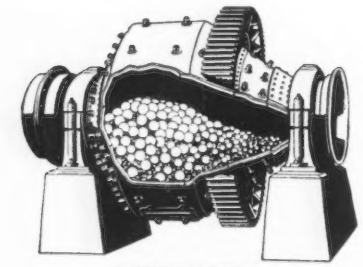
EDISON ALSO MAKES THE FAMOUS "V.P." VOICEWRITER AND THE TELEVOICE SYSTEM

Wisconsin *(Continued)*

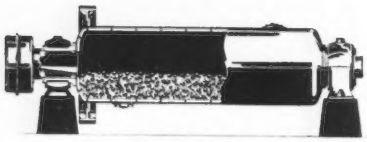
circuit with a 30 in. x 18 ft Akins-type classifier. Classifier overflow will be pumped to a 4-cell lead circuit composed of Denver No. 18 Special cells, using 3 cells as roughers and one for cleaning. Concentrate from the lead circuit will be further cleaned on a 5 ft x 17 ft Deister table.

Tailings from the lead circuit will go to a 5 ft zinc conditioner and thence to a zinc circuit composed of 10 Denver No. 18 Sub A cells using 8 cells as roughers and 2 cells as cleaners. A portion of the tailing from the last rougher of the zinc circuit will be tested on a pilot table and the remainder pumped to the tailing pond. Concentrate from the zinc circuit will be dried on a 6-ft 2-disc American filter and taken by truck 3 mi to the Northwestern Railway at Livingston, for shipment.

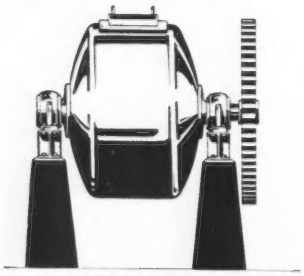
Since last publication of news of the Mifflin Mining Co. there has been a change of ownership. Herbert Turner of the Turner Construction Co. of Boscobel is now owner of the Mifflin Mining Co. John Howland of the original partnership remains as manager of both mine and mill.



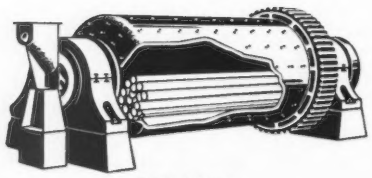
CONICAL MILLS



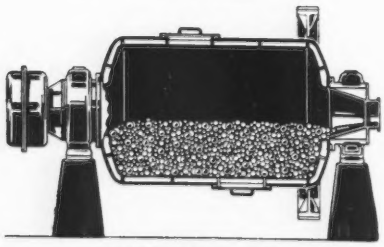
TUBE MILLS



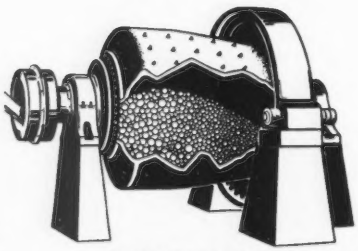
BATCH MILLS



ROD MILLS



CYLINDRICAL MILLS



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WYOMING

A contract for about 16,000 ft of diamond drilling near Hulett, has been awarded by the AEC to Minerals Engineering Co., Grand Junction, Colo. Both core and non-core drilling will be done in an effort to increase known uranium ore reserves in the Black Hills area. The winning bid was for $2.57 per ft.

IN CANADA

QUEBEC

Quebec Copper Corp., new producer in Bolton County, south of the St. Lawrence, has stepped up its milling rate to 750 tons daily. Recovery reportedly is averaging 93% from ore that grades 1.95% copper.

Ore reserves are now calculated at 600,000 tons proven in the main orebody down to the 1100-ft horizon, with good intersections had in deeper drilling down to 1500 ft. Average grade is 2% copper.

Opemiska Copper Mines (Quebec) Ltd. in the first four months of 1954 milled 36,400 tons averaging 5.98% copper, 0.067 oz gold per ton, and 0.75 oz silver.

Ore currently being treated is above the mine's average grade of 4-5%, the company being anxious to push production to the limit during its tax-free period; it is signficant, however, that the first hole put down in the No. 3 zone below the 400-ft level returned a true width of 27 ft averaging 6.61% copper; an intersection with intriguing possibilities for depth development.

Chances that Canada will add lithium to its mineral production list are brightened by recent developments at the property of Quebec Lithium Corp. in LaCorne, LaMotte, and Piedmont twps.

A start was made in July on shaft sinking, with three levels to be established to a depth of 450 ft. Extensive surface drilling has indicated 3-million tons averaging 1.11% lithia. The new company is controlled and financed by Sullivan Consolidated Mines, veteran gold producer of the Bourlamaque camp, and progenitor of East Sullivan Mines.

A new orebody has been opened by Golden Manitou Mines on its bottom level at 2300 ft, where drifting showed a length of 650 ft that averaged 7.5% zinc, 1.5% lead, and 8.9 ozs of silver across width of 11.3 ft.

The new ore, first to be encountered in some months of depth development, gives a brighter hue to the mine's depth potential. Plans are now being made to deepen the shaft for further exploration.

Johns-Manville Corp., world's biggest producer and user of asbestos, has enough ore in sight to satisfy its requirements for 100 years, the firm told its annual meeting.

While the company is active in many countries, most of this ore still rests in the original Johns-Manville mine at Asbestos, Que. The Jeffrey mine there,

the world's largest, is making steady progress in conversion from open pit to underground mining; more than 75% of the 15,000 tons mined daily now comes from underground workings.

Discovery of a gold deposit just north of Noranda was announced early in June by Quebec's Prime Minister Duplessis.

ONTARIO

An ambitious project is being laid out by Killala Lake Mines in the Port Arthur mining division northwest of Lake Superior, where big acreages of ground have been secured following a large scale program of aerial surveying.

The survey work, covering approximately 25,000 sq mi, was done by Manitouwadge Mining Syndicate, which holds vendor interest in Killala.

Properties held by the new company include 422 claims at Killala Lake, two groups of 67 and 27 claims at Bamoos Lake, an optioned group at Cirrus Lake, and 42 claims east of Manitouwadge Lake. Intensive surface work will be done on all groups this summer.

Ontario has a new lead-zinc-silver producer, Jardun Mines having started tuning up its 300-ton concentrator in May. Initial production, at a rate of 100 tons daily, is coming from development faces in the No. 4 shaft area, and the rate will be stepped up to capacity as soon as possible.

Drilling in the No. 4 area has indicated 53,800 tons averaging 13.14% lead-zinc and 1.53 ozs of silver.

Castle-Trethewey Mines has resumed production at its Gowganda silver mine following its winter shutdown, and is treating close to 100 tons daily with heads approximating 60 ozs silver per ton. In 1953 it was Ontario's leading silver producer with output somewhat more than 1-million oz.

Shaft sinking will be started by midsummer at the property of Croft Uranium Mines in Southeastern Ontario's Bancroft area. Initial objective will be 500 ft below the adit in which drifting has outlined more than 1000 ft of ore. Width, not yet established, is somewhat greater than that of the drift. Croft is a subsidiary of Macassa Mines, Kirkland Lake gold producer.

Steep Rock Iron Mines anticipates no difficulty in meeting its production objective of 2-million tons of iron ore this year. Mining operations, both at the Errington and the new Hogarth mine, are going smoothly; and the company receives an added benefit this season through a 28c reduction in freight rate on rail haulage to the Lakehead. During the winter season a record stockpile of 350,000 tons was built up for spring shipment.

Shaft sinking at the Porcupine property of Central Porcupine Mines has reached a depth of more than 200 ft below its collar on the 5500-ft level. The work is being done by Coniarum Mines, Central's neighbor, and was started from an extension of Coniarum's workings.

NEW BRUNSWICK

Keymet Mines is losing no time in rebuilding its mill which was destroyed by fire some weeks ago.

Company's objective is to have the 200-ton plant in production before the snow flies, although the job involves building a new mining plant, and even replacing the headframe. The loss was covered by insurance.

In the meantime, the shaft will be deepened another 300 ft to provide two additional levels at 1050 and 1200 ft.

Steady progress toward production is being made by Brunswick Mining & Smelting Corp. A pilot mill of 150 tons capacity will be installed by year-end, and by mid-1955 enough data will have been gathered to permit the start of planning on the 4- to 5000-ton mill which will be installed.

Mine development, too, is going head. Fine roads have been built, much of the big area underlain by the two orebodies has been cleared, and mining camps are under construction.

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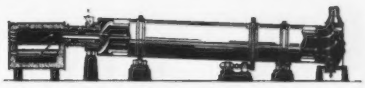
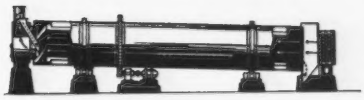
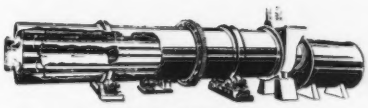
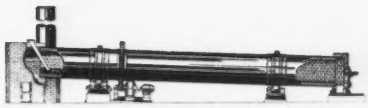
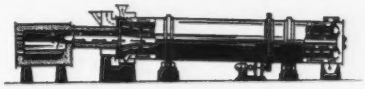

SINGLE-SHELL DIRECT-HEAT
PARALLEL-FLOW DRYERS

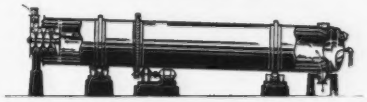

SINGLE-SHELL DIRECT-HEAT
HOT AIR DRYERS


DOUBLE-SHELL
SEMI-DIRECT HEAT DRYERS


ROTARY KILNS


DOUBLE-SHELL
INDIRECT-HEAT DRYERS

ROTARY COOLERS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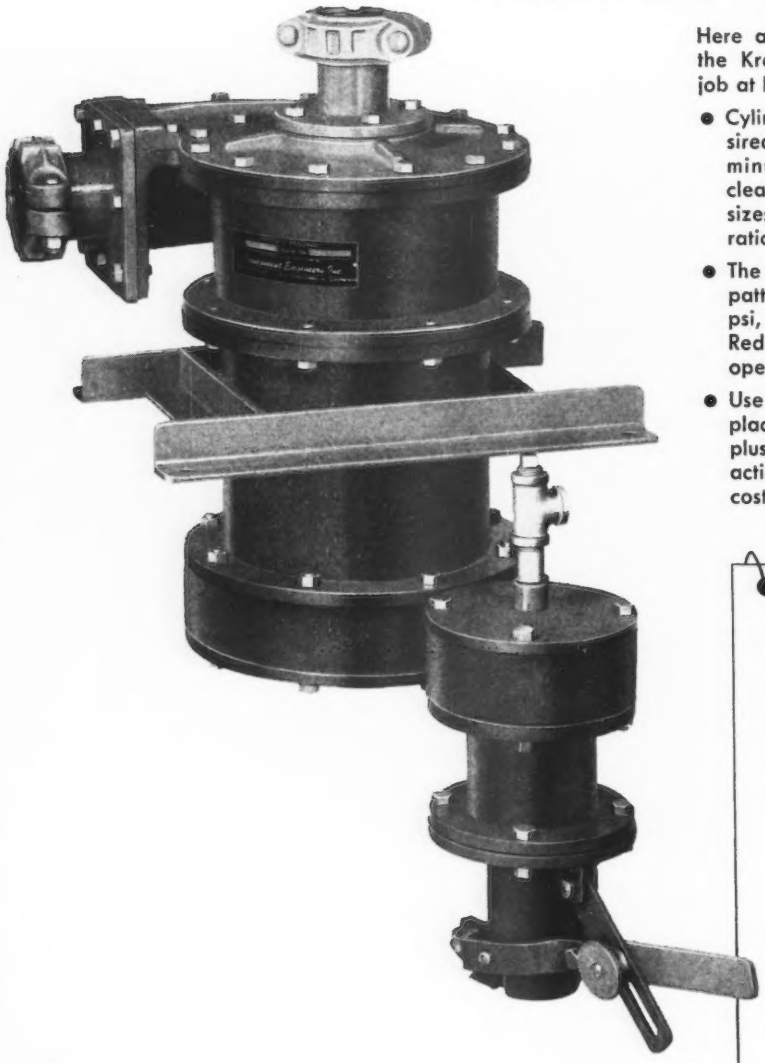

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- Cylindrical two-stage design reduces undesired plus sizes in the overflow and undesired minus sizes in the underflow, produces cleaner, higher density sands **without** tramp sizes in the overflow. This is sharper separation .
- The primary cylinder creates an ideal fluid pattern that gives greater efficiency at lower psi, permits use of larger vortex finders. Reduced power requirements mean lower operating costs.
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HERE IS BETTER CLASSIFICATION

(Number 1 of a series)

Eight Krebs Model EE10-9 cyclones, each handling 15 TPH, are installed at the plant of Crystal Silica Company, Oceanside, California. This installation was preceded by a full scale pilot plant study lasting a month. Results of pilot plant run No. 9 are given in this table.

	FEED	OVERFLOWS	UNDERFLOW
GPM	188	148	40
% Solids	32.1	8.0	80.2
TPH	18.8	3.1	15.7
% + 35	54.3		65.2
+ 65	21.0		25.3
+200	7.2	0.5	8.5
—200	17.5	99.5	1.0
	100.0	100.0	100.0

Perhaps as pertinent as the classification efficiency is the attrition action on these sands, and the wear resistance of the molded liners on such coarse feed with angular quartz particles.

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New Brunswick *(Continued)*

A stripping job is under way on the Austen Brook orebody, and a 3-compartment shaft is being sunk to 1500 ft alongside the Anacon-Leadridge deposit.

Shaft-sinking at the New Larder "U" Island Mine near Bathurst was expected to get underway early this month. The shaft will be sunk to 1500 ft. Collar for the 3-compartment shaft already has been completed to more than 30 ft.

Ore reserves, proven and probable, have been estimated to be about 2-million tons with a combined lead-zinc grade of 8.2%. Copper and silver values also are present.

Personnel at the property include W. F. Chisholm, manager; F. Fawcett, master mechanic, and K. Hope, engineer-geologist.

BRITISH COLUMBIA

Union members at Texada Mines Ltd. on Texada Island have by-passed a direct wage increase in order to help their company compete on world markets.

According to Clifford Parker, spokesman for Operating Engineers' Union (AFL) type contract signed with the company does not change the wages of between $1.65 and $2.20 per hour.

New gains in the contract include statutory holidays with pay, two weeks holidays with pay after three years' service, and company payment of half of the employees medical scheme.

"It would be useless getting greater benefits unless the employer is able to compete on world ore markets," Parker said.

Operation of the Texada Mines is open pit strip mining for magnetite ore.

New ore discoveries plus improvement in reserves and operating efficiency have been reported by Cariboo Gold Quartz Mining Co. Ltd.

Consulting Engineer E. E. Mason reports a new find of massive replacement ore above the 1900-ft level. He states it is 150 ft long as developed, over four ft wide, of plus 1.00 grade. He added that 30,000 tons of 0.46 grade quartz ore has been found in the reopened Rainbow workings.

At the silver-lead-zinc property of Hamil-Lead Mines Ltd., Argenta, a crew is preparing for a diamond-drilling program. Work is planned to increase tonnage of indicated ore in the A and B orebodies with a view to opening up a new level 1000 ft below present development.

Expansion of operations of Yale Lead & Zinc Mines Ltd. at Ainsworth is under consideration. H. D. Foreman, mine manager, states this results from development during the past year of the largest orebody yet discovered.

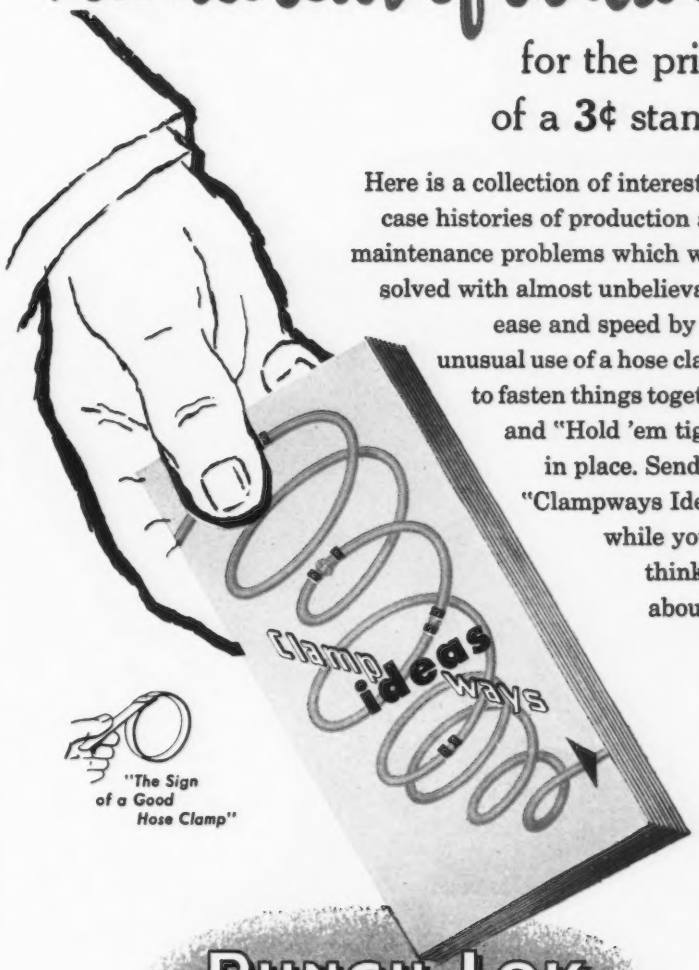
Ore in sight is sufficient for four years' operation of the present plant of 160 tons daily capacity. Plans call for driving a new adit above the level of the mill and increasing mill capacity to match new reserves. Yale lead is milling at present 4800 tons a month.

ideas...worth

hundreds of dollars

for the price of a 3¢ stamp

Here is a collection of interesting case histories of production and maintenance problems which were solved with almost unbelievable ease and speed by the unusual use of a hose clamp to fasten things together and "Hold 'em tight" in place. Send for "Clampways Ideas" while you're thinking about it.*



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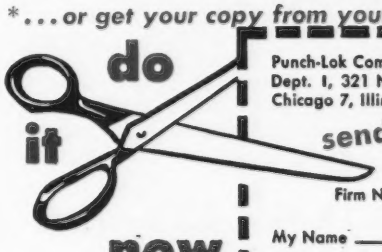

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HARDHED matrix for non-abrasive formations
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YUKON

White Pass & Yukon Corp., Ltd., a railway company, said in its annual report that a geological survey of area adjacent to its rail line between Whitehorse and Skagway had revealed a nickel and copper showing.

White Pass has set up a separate company, British Yukon Exploration Co., Ltd., to do its mining.

American Smelting & Refining Co. is reported to be developing a large zinc-lead-silver deposit on the Highland River. Farther north, Hudson Bay Mining Co. has located another zinc-lead-silver deposit.

SASKATCHEWAN

Saskatchewan's first low-grade uranium ore processing mill will start operating early this summer in the nearby Lac La Ronge area.

Officials of La Ronge Uranium Mines Ltd. state that the plant will cost about $115,000 in the initial stage, but may increase to $10-million by July 1955.

The "pilot" mill will be located near Nistowiak Falls, northeast of the townsite of La Ronge. Work on the power plant already has started.

ALBERTA

Production is to get underway late this month at Sherritt Gordon Ltd.'s new nickel refinery at Fort Saskatchewan. The plant, first of its kind, uses a chemical process for recovering the metal.

Meanwhile, it was announced that the mine at Lynn Lake is reaching the stage where full production will be possible with the concentrating plant handling 2000 tons daily. Ore reserves have been reported at 14,055,000 tons, assaying 1.223% nickel and 0.618% copper.

MANITOBA

Hudson Bay Mining & Smelting reports that shaft sinking is planned for its new Coronation property, 13 mi southwest of Flin Flon. The Coronation property embraces an estimated 545,000 tons of ore reportedly averaging 5.37% copper and about $2 per ton in gold and silver values. At Hudson's Birch Lake property, 9½ mi southwest of Flin Flon, shaft sinking has reached the mid-way point toward its 1400 ft objective.

God's Lake Gold Mines Ltd. reports that additional work this year is planned at its Nickel Lake Mines property, 30 mi east of Lynn Lake.

IN LATIN AMERICA

ARGENTINA

Argentina, which heretofore has depended on imports for its aluminum needs,

Profits start in the Pit!

There are over 1200 "Eucs" on Minnesota's Iron Ranges—more than all other makes of off-the-highway trucks combined! Rear-Dumps, ranging in payload capacity from 15 to 50 tons, work the year around hauling ore and heavy overburden. On this tough "proving ground" Euclid performance has consistently paid off in more production and lower hauling costs.

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Argentina *(Continued)*

reportedly is planning to invest $25-million to build an aluminum plant in Chubut, near Comodoro Rivadavia.

The project, now in the blueprint stage, is designed for annual production of 10,000 tons. Argentina aims at being self-sufficient aluminum-wise by the end of 1957.

Zinc and cement producers already are operating in Chubut, sustained with low-cost power from natural gas and water resources. Bauxite is unavailable in Argentina and it is now planned to feed the proposed aluminum plant with high grade aluminum oxides of clays reported existent in the neighboring territory of Neuquen. Reports of these clays are based on recent explorations by local and German geologists who have been tapping the whole southern area extensively.

Most of the machinery and equipment for the proposed plant is earmarked for importation from Europe, principally Western Germany. In addition, it is expected that the new industry will be financed partially by German and Italian capital.

President of a newly-formed Chamber of Aluminum in June began a tour of Europe to study aluminum plants and marketing practices.

BRAZIL

Following are nugget reports on nine of Brazil's leading mining operations:
Industria e Comercio de Mineiros S.A. (ICOMI). Project: Amapá manganese development in Federal territory of Amapá, 93 mi northwest of the port city of Macapá. Export-Import Bank has granted US $65-million credit for the project. Ore-zone size: 300-2000 ft by 6 mi long. Estimated reserves: 14-million tons of shipping-grade ore. Estimated life of project: 40 to 50 years. Production rate: 500,000 tons per year. Open pit mining. Estimated 2½ years before port and railroad to deposits will be completed to permit extraction of manganese. Bethlehem Steel has a minority interest.

Socieade Brasileira de Mineração Ltda. (has lease contract to maganese mining rights from State of Mato Grosso, but has granted purchase and sale contract to Compania Meridional de Mineração, in which firm United States Steel has 49% interest).

Project: underground mining of manganese and iron at Morro do Urucum, State of Mato Grosso, about 20 mi south of Corumbá. Reserves total 4,420,000 metric tons of measured manganese ore, 11,750,000 metric tons of indicated ore, and 17,500,000 metric tons of inferred ore, with a content of about 45.6% manganese and 11.1% iron. It will be 2 years before project can get started.

Harbison-Walker Mineira Ltda. Project: Magnesite mining in and around Orós, State of Ceará in northeast Brazil, 416 railroad mi and 480 road mi from port city of Fortaleza. Eight magnesite deposits of high-grade ore in general area, graded at about 45% magnesite. Diamond drilling started this year.

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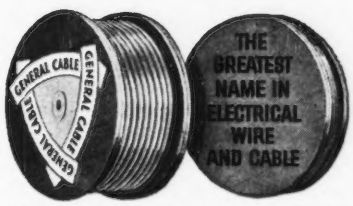

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Brazil *(Continued)*

Novas Industrias Olinda (subsidiary of Usina Catende S.A., Recife). Project: Mining of phosphate deposits. Mill under construction now. Proved reserve of phosphate rock: 25-million tons. Olinda will develop deposit of 6-million tons of proved reserves. Chemical analysis indicates metallurgical components in order of 21.4% P_2O_5; 46.8+ B.P.L; 32.6% CaO and 34.3% insoluble. Analysis of high-grade concentrates indicates 73-76% B.P.C. A dragline is being used now, but Olinda expects to obtain a flotation unit from United States later.

St. John del Rey Mining Co., London. Gold mine at Ouro Preto, State of Minas Gerais. Long term project started several years ago to modernize mine and mill through mechanization, aimed at doubling production of gold. Production 1000 tons per day. Have started 1000-meter by 7 meter shaft, are down one-third of way. Modernization program stalled by labor difficulties. Gold graded at 12-13 grams per ton. Mine has 50-year reserves.

Societe Miniere et Metallurgique de Peñarroya (France), for Cia Plumbum S.A. of Ribiera, State of São Paulo. Project: First flotation mill for concentrating lead ore. Operating on direct smelting ore; now will use concentrates and work over refuse dumps. Mill began operating in March. Project actually in state of Paraná, but Ribiera is nearest city. With new flotation mill, expect to obtain 150 tons per day of ore, compared with 60 tons now obtained. Eight percent lead feed to mill reported. Have spent Cr$50 million (US $2.5-million) on mill and equipment to get new capacity.

Dragagem de Ouro Ltda. Project: gold-dredging operation at Santa Lucia on the Rio dos Velhos, north of Belo Horizonte. Began operations around March with gold dredge obtained from Charles H. Thurman of San Francisco, dismantled from an old California gold-mining operation. The 9-cu-ft dredging is handling 3500 cu yd daily.

Mineração Sertaneja S.A. (Mauricio Hochschild, formerly of Bolivia) Project: Tungsten mining at Jurucutu, Rio Grande de Norte, Hochschild bought two undeveloped prospects, and now developing the mines. Will build two small mills with capacity of 50 tons of ore daily from each mill. Began 1953.

Cia. Brasileira de Aluminio. Project: Completely integrated aluminum plant slated to produce 10,000 tons of aluminum annually from 1954 on; 15,000 tons by 1957; 20,000 tons by 1960; 25,000 tons by 1962, and 50,000 tons by 1965. Installation for extraction, processing and shipment of bauxite launched in 1952 at Poços de Caldas in State of Minas Gerais, 360 km from plant near Sorocaba, 75 km from São Paulo City. Bauxite deposits claimed of such high quality that production is based on use of only 3.5 tons of steam per ton of metal instead of the usual 10 tons.

BRITISH GUIANA

Following is a roundup of some of the most important mining projects currently operating in this country:

British Guiana Consolidated Goldfields Co. Ltd.: Two gold dredges, Potaro River; 1953 averages 2.71 grs per cu yd, and 3.90 grs per cu yd respectively. Production 1953: 17,277.68 oz bullion gold. Investment: $4,700,000 (BWI) (approximately). Project: One new dredge now being flown into Konawaruk River. Grade: proved 3.28 gr/cu/yd to 3.50 gr/cu/yd. Starting date: end of 1955. Exploration: in Puruni River.

Morabisi Mining Co.: Project: Alluvial mining of columbite in Mazaruni District. Investment in excess of $1-million (BWI). Grade: about one ton of concentrates shipped to U.S.A. assayed 65% combined columbium and tantalum. Production rate: expect about 10 tons per month. Starting date: August 1954.

Columbium Corp.: Project: alluvial mining of columbite in Mazaruni District. Present position: active prospecting.

African Manganese Co. Ltd.: S.A. Project: Mining of mantle manganese deposits in North Western District. Present posi-

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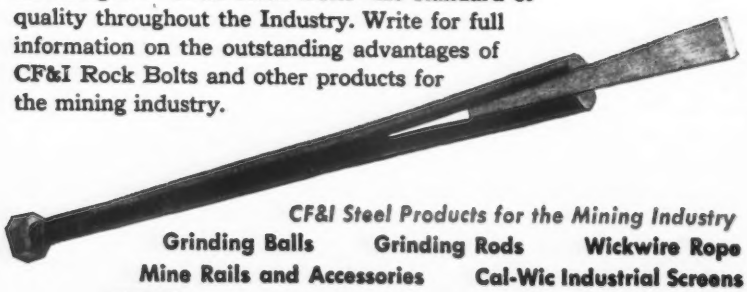

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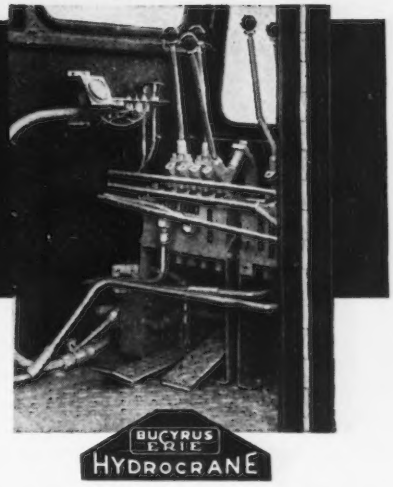

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British Guiana *(Continued)*

tion: prospecting by pits, trenches and adits. Vigorous campaign of prospecting and development will continue through out 1954. Reconnaissance exploration: for manganese in Cuyuni River area.

Demerara Bauxite Co.: Largest mining company in British Guiana. Production in 1953: 2,104,820 tons bauxite mined by open pit in Mackenzie and Ituni areas. Exploration: extensive reconnaissance survey and diamond and Empire drilling. Exploration expenditure in 1953: more than $200,000 (BWI).

Reynolds Metals Co.: Open pit mining of bauxite at Kwakwani, Berbice. Exploration: active drilling and reconnaissance survey in Berbice and Demerara River districts.

Harvey Aluminum Co. Ltd.: At present exploring for bauxite deposits by reconnaissance surveys west of the lower Essequibo River which helps link interior with Atlantic Coast.

Rich columbite deposits have been found in the Mazaruni District, the Geological Survey Department reported in Georgetown, the growing capital city of British Guiana.

CHILE

Anaconda Copper Mining Co. announced that operations have returned to a 6-day week basis at its Potrerillos and Chuquicamata Mines. This will boost output 2600 tons a month.

Kennecott Copper Corp., through its subsidiary, Braden Copper Co., tentatively agreed to take similar action on condition that demand is sustained through June and July. Braden owns El Teniente Mine.

Both Anaconda and Kennecott had been operating in Chile on a 5-day week basis.

COLOMBIA

Pato Consolidated Trading reportedly has purchased 16 alluvial and vein gold mines from Nechi Consolidated Trading Ltd. for about $2-million. The mines are in the Antioquia Department.

MEXICO

Secondary reaction to the government's recent peso devaluation and export tax boost began setting in last month among many levels of Mexican mining.

The miners union reportedly appeared to be becoming united in a drive for pay hikes. When devaluation first was announced (see *E&MJ*, June 1954, p 157), some unionists asserted that it would be better for all concerned to withhold wage boost demands until 1955 when there is to be the regular revision of collective labor contracts in mining. Inflation, however, has sent prices soaring to unexpected heights and mining unions leaders are said to be formulating demands for immediate wage hikes.

Drive for pay increases is expected to take the form of peaceful renegotiation rather than the ultimatum-type of bargaining. Mining circles reportedly do not expect the financial dislocation to foment strikes. Unionists are said to favor the problem being settled on the basis of pay tilts by individual employers. Unions have indicated a readiness to cooperate with employers.

On another level, mining has asked that it be exempted from the increase to 25% (from the pre-devaluation 15%) on the export surcharge tax.

Lic. Jose Campillo, secretary, Mining Chamber, contends that the government can well afford to exempt mining from the increase. He points out that the government obtains much revenue from other mining industry levies, including income tax.

Inflation, which has tied a kite to the price of dynamite, may force many small mine operators out of business. Dynamite and other blasting materials which cost 28 pesos in 1952 now costs 108 pesos. National Federation of Small Scale Miners' Associations has appealed to President Adolfo Ruiz Cortines, who has turned over their plea to the Ministry of National Economy. The Federation told the President that the price increase is out of proportion to the 45% slash in the value of the peso.

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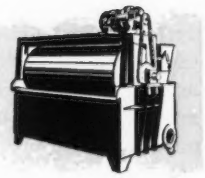

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Mexico *(Continued)*

Ing. Constantino Perez Duarte, Subsecretary of National Economy, has been quoted as saying that the Mexican government has "no intention of expropriating or nationalizing mining in any way."

He reportedly added, however, that the government insists that "mining be exclusively exploited by capital that respects our laws and aspires to contribute toward our development."

Mining Stimulation Commission has received a plea from the El Bote mining cooperative, El Bote, Zacatecas, for pumps to dewater lower levels of its mines. The cooperative contends that it could recover financially if only it were able to work the gold, silver and copper deposits.

Finding of promising gold and silver deposits and "important" iron showings at Uspanapan, Tarifa Municipality, Oaxaca, have revived major mining hopes in the Oaxaca and Chiapas areas of the Isthmus of Tehuantepec. The Oaxaca administration reportedly is so enthusiastic that it plans to build a road to service deposits.

Completion of a 10-mi road between Toliman and Zimapan, Mezquital District, Hidalgo, is greatly benefiting eight mines which heretofore had been packing out production by mules. The eight mines reportedly have an aggregate output of 5000 tons monthly of gold, silver, lead, zinc and copper. Mines are owned by small-scale operators.

Boleo-Estudios E Inversiones Mineras, S. A., (BEIMSA) Santa Rosalie, Baja California, on March 31 ceased all mining, smelting, purchasing and business operations. The copper mine and smelter, together with the firm which it succeeded, Compagnie Du Boleo, had been producing small tonnages since 1892.

PERU

An average of 18 ships a month are now putting in at San Juan for loading and transporting ore from the Marcona iron mine to U. S. Steel Corp.'s plants in the United States (for a full discussion of the Marcona Mine, see *E&MJ*, January 1954, p 84).

Meanwhile, Harlan A. Walker, Marcona general manager, said that a large dust-collecting system had been installed at the mine's jaw crusher.

The dust-collecting system, put into operation in April, is known as a Rotoclone. It was purchased from the American Air Filter Co. of Louisville, Ky.

Exploration at the 30,000 hectare Acari iron ore concession will continue for another two months, according to estimates of N. F. Crossley, manager of Utah-Peru Inc., a subsidiary of Utah Construction Co.

The exploration program is being carried out by Utah-Peru for Republic Steel Corp. of Cleveland on concessions of Pan American Commodities, S. A., of Lima (see *E&MJ*, April 1954, p 174).

Diamond drilling is organized on two 10-hr shifts. John Jepsen is foreman at Acari. Work also is being done on five small exploration tunnels under subcontract to Mine Management, S. A. It was expected that the tunnels would be completed by May.

IN AFRICA

A 2-mi conveyor system, the longest in Africa, is soon to be installed at the Williamson diamond mine at Tanganyika, East Africa. The conveyor system will replace a fleet of 15-ton trucks which frequently bog down in mud.

Current production has been estimated at $24-million a year, about 12% of the world total. When a new plant and the conveyor system are put in operation, it is expected that the handling of diamond ore will be increased four-fold.

Diamond deposit was discovered in 1940 by Dr. John Thorburn Williamson, a former Canadian geologist. The conveyor system was designed by engineers of Robins Conveyors (S.A.) Ltd., Johannesburg, a subsidiary of Hewitt-Robins Inc., Stamford, Conn.

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Africa *(Continued)*

A team of United States geologists in the employ of Rio Tinto Copper Ltd. is prospecting for copper in the Chisamba District of Rhodesia.

Several samples have been taken. One borehole is being drilled. Rumors have it that an important discovery has been made but the geologists have offered no confirmation.

A blue-white diamond weighing 426½ carats has been found near Pretoria in the Premier Mine, which is controlled by De Beers Consolidated. The diamond is said to be the largest single gem find for many years.

Diamond experts in London conservatively estimate the value of the newly-found gem at $280,000.

Operations at the Premier Mine were suspended in 1932 and did not resume until 1945. Underground mining methods were adopted and full-scale production was reached in the month of November 1951.

Premier is noted today for its high-grade industrial diamonds and also for the fact that it was here that the famous 3023-carat Cullinan diamond was found nearly 50 years ago.

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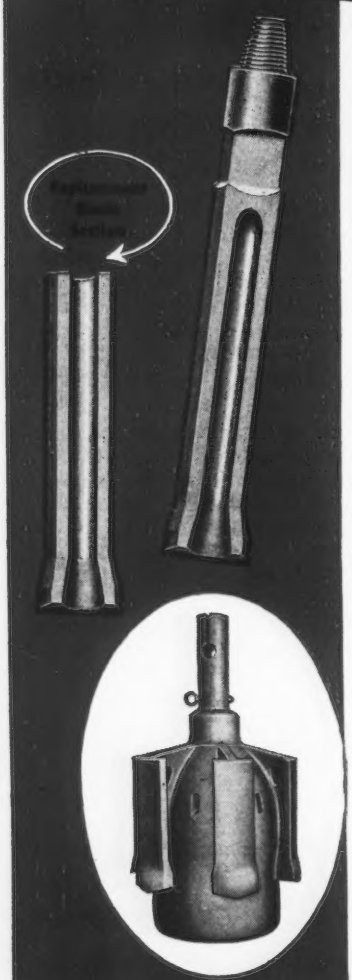

SPANG CHURN DRILL BITS, famous for long life and economy in the drilling of blast holes for the fragmentation of minerals or overburden, drill *more-holes-per-bit* at *less-cost-per-hole,* because they are fully heat-treated from end to end and have the *extra strength in pin and blade sections* to stand up under the toughest drilling conditions. They are made with semi-dressed ends for quicker, easier finish-dressing, in High Carbon, A.I.S.I. 4340, and Spang Molloy Steel.

Available also, as an added economy, are SPANG REPLACEMENT BLADE SECTIONS in the same grades of steel, and uniform forge section, for welding to pin and collar sections of original bits when long service has worn the integral blade to a point where replacement is desirable.

Anyway you look at it, SPANG BITS are your best buy for more holes at less cost per hole.

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For over 60 years Manufacturers of Spang Weldless Jars and a Complete Line of Cable System Drilling and Fishing Tools for Oil and Gas Wells, Water Wells, Prospect Drilling and Shot Blast Holes.

Drilling program has been completed at the farm Rhenosterhoek No. 52 in the Western Transvaal. This was announced by Klerksdorp Consolidated Goldfields, which added that the drilling brought encouraging results. Last year the company was given permission by the Minister of Mines to investigate occurrences of uranium on its property.

Construction of a 235-mi overhead cable road in French Equatorial Africa is being considered by the British Ropeway Engineering Co. The overhead cable road would span dense jungle land and would be used to transport manganese ore from the interior to the coast. Reportedly involved is an estimated 50-ton deposit of 50% manganese ore. Herbert Shields, director-general of the British firm, is said to be studying the project along with engineers of the French government and those of United States Steel Corp.

IN AUSTRALIA

Australia's first private uranium mine already has reached the production stage. The mine, the Fleur De Lys at Brock's Creek, is about 110 mi south of Darwin. Ore will be carted to Rum Jungle.

Thirteen companies are now searching for uranium in the Northern Territory and prospecting activity has been officially described as "exceptionally keen."

At least 12 new companies are preparing to enter the field in the near future, most of them waiting for the end of the wet season.

Australian gold mining is expected to receive a special subsidy. On the basis of plans now under study the subsidy will be paid to producers whose cost of production is £A14-10-0 or higher, and an amount not exceeding £A1-10-0 per oz will be paid. Aim is to interest mine owners in the exploitation of numerous low-grade gold mines.

Informed Australian circles claim that gold prices in the London and Continetal free markets are certain to increase by up to $1 per oz before the end of 1954. Meanwhile Australian gold exports are aimed mainly at markets in Macao and Hong Kong with some offerings to the London gold market. Last published figures show that Macao has been the main buyer of Australian gold.

Rio Tinto Co. Ltd., the U. K. mining operator, is negotiating with Brocks Creek Uranium N. L. for an option on certain mineral claims held by the Australian company. Plans provide for the creation of a jointly-held company to operate in these fields. On its currently developed field, the Australian company has already achieved some measure of success and expects good deposits of uranium ore.

Northern Uranium Development N. L. is joining in an aerial scintillometer survey in the Mt. Isa area with Uranium Mines N. L. Surface discoveries in the area indicate considerable promise as far as uranium deposits are concerned. In

BEFORE: Face of metal mine drilled, loaded and connected up, ready for setting off the charge with Du Pont CD-32 Blasting Machine.

AFTER: Result of 44-hole shot connected in two series of 22 caps in parallel.

FIRING—operator depresses charging switch, waits until pilot light glows, then throws firing switch.

Midwest metal mine reports:

Du Pont CD Blasting Machine Gives Extra Measure of Safety

Saves money, promotes efficiency, too

Safety is a prime consideration in mining. This midwest metal mine bought a Du Pont CD-32 Blasting Machine for greater efficiency and economy, of course, but maximum safety was the main reason. They have realized all three advantages.

Here's why: Du Pont CD (Condenser Discharge) Blasting Machines

1. Have extremely high capacity for their weight and size.

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3. Eliminate the human element of generator-type machines.

4. Have a pilot light which tells the operator when to fire the blast.

5. Have many important safety features included in the wiring and switching system.

6. Can be used for firing shots connected in series, parallel, or parallel series.

7. Eliminate need for installation and maintenance of power-firing circuits.

The CD-32's only one of the four dependable Du Pont CD Blasting Machines now serving the industry. All are designed to increase safety, economy and efficiency—and one of them's made to meet *your* needs. To get the facts on all four, contact the Du Pont Explosives representative in your district or write: E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

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Blasting Supplies and Accessories

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

Australia *(Continued)*

the Spreadborough lease area good Geiger counts were reported and satisfactory reports have been received from the Leichardt lease zone.

Diamond drilling will start soon on the Hill 50 Central leases at Mt. Magnet in Western Australia. Preparations for shaft sinking are nearing the completion stage. The Perseverance shaft will be deepened by some 130 ft and three diamond drill holes will be drilled. A contract has been let for a total of 5000 ft of diamond drilling.

Richest gold crushing in Australia for several years was reported from Western Australia where a parcel of 21 tons of ore yielded 749 oz 15 dwt. The average yield was 35 oz 14 dwt a ton and a minor gold rush followed the discovery. The ore, which was quartz and greenstone, was located at a depth of only 10 ft.

This discovery was made only 12 mi from where gold was first discovered on the Eastern Goldfields in 1887. The likely size of this deposit is now being determined.

Another interesting gold strike in Western Australia was made in the Cox's Find district, about 40 mi north of Laverton. Hansel Mundy Gold Mining Co. which took over the field, reported that samples taken from 20 ft underground assayed up to 5¾ oz and that the average assay was 3 oz 10 dwt. Dish samples from the Boot shaft winze were 10 to 12 oz over 10 in. Some assays from the winze were 15 oz to the ton.

One of Australia's leading gold dredging companies, Wellington Alluvials Ltd. reports a much better year ended April 30. The Company has treated only 3,130,400 cu yd compared with a previous year's 3,633,000 cu yd for a return of 167,390 oz which was a good improvement on the previous 115,670 oz.

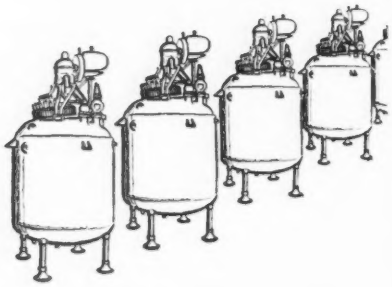
In addition to its Dundas and Ravensthorpe fields, Western Uranium Mines N. L. also will work uranium deposit near Cue in Western Australia and on the Pilbara Goldfield in northwest Australia, the last one in conjunction with Northwest Tantalum N. L.

Shaft sinking and diamond drilling have been ordered. The plateau where samples have been taken is only a short distance from a highly radioactive crust of the lake bed which proved to be disappointingly low in uranium despite its radioactivity.

More than a mile of trenches have been excavated disclosing two types of uranium mineralization. The first is a fracture zone with koalinization and secondary silicification having an iron stained bowwork structure. The second type of mineralization occured in a horiat a depth of about 3 ft below the surzontal zone, 3 to 5 ft thick, commencing face.

Miners are seeking mineral rights at Southern Cross in Western Australia following discovery of a rich pocket of gold ore on a neighboring farm. The pocket reportedly has yielded 749 oz 15 dwt of gold from 21 tons of quartz and greenstone, averaging 35 oz 14 dwt of gold to the ton. Farm is 210 mi north of Perth.

This research chemist needs 30 ounces...



and this company needs 30 tons a year...

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*Complete stocks carried here

IN EUROPE

YUGOSLAVIA

A new asbestos mine at Rujiste in Serbia will be expected to begin operation this summer. Ore reserves are estimated at about 70,000 tons.

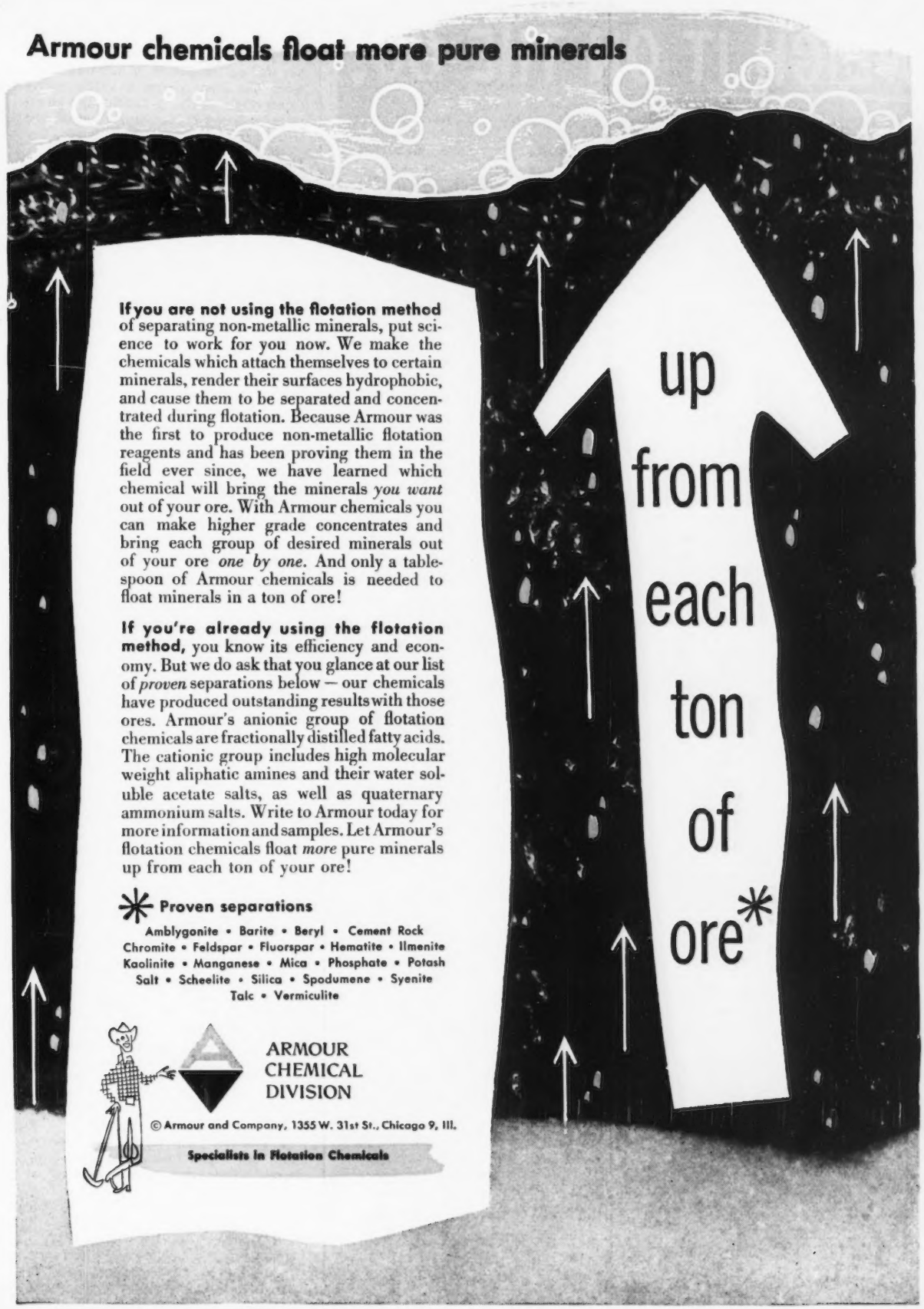
AUSTRIA

Austrian Salzburger Aluminum Gesellschaft expects to boost annual aluminum output from 5700 tons to 7700 tons after just completing a second power station.

Salzburger Bergbau und Tiefbohr (Salzburg Mining & Deep Drilling Co. Ltd.) has resumed mining near Newkirchen, in the Alpine Grossvenediger Massiv.

This operation, a private enterprise,

Armour chemicals float more pure minerals



If you are not using the flotation method of separating non-metallic minerals, put science to work for you now. We make the chemicals which attach themselves to certain minerals, render their surfaces hydrophobic, and cause them to be separated and concentrated during flotation. Because Armour was the first to produce non-metallic flotation reagents and has been proving them in the field ever since, we have learned which chemical will bring the minerals *you want* out of your ore. With Armour chemicals you can make higher grade concentrates and bring each group of desired minerals out of your ore *one by one*. And only a tablespoon of Armour chemicals is needed to float minerals in a ton of ore!

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EXCLUSIVE FEATURES

- Accurate . . . within ± ½ of 1% of actual weight from maximum to 50% of meter's rated capacity; within 1% from 50% to 25% rate; within 2% from 25% to 10% of rated capacity.
- Automatic totalizer compensation for variations in belt speed and changes in belt weight.
- Responds accurately to rapid load variations.
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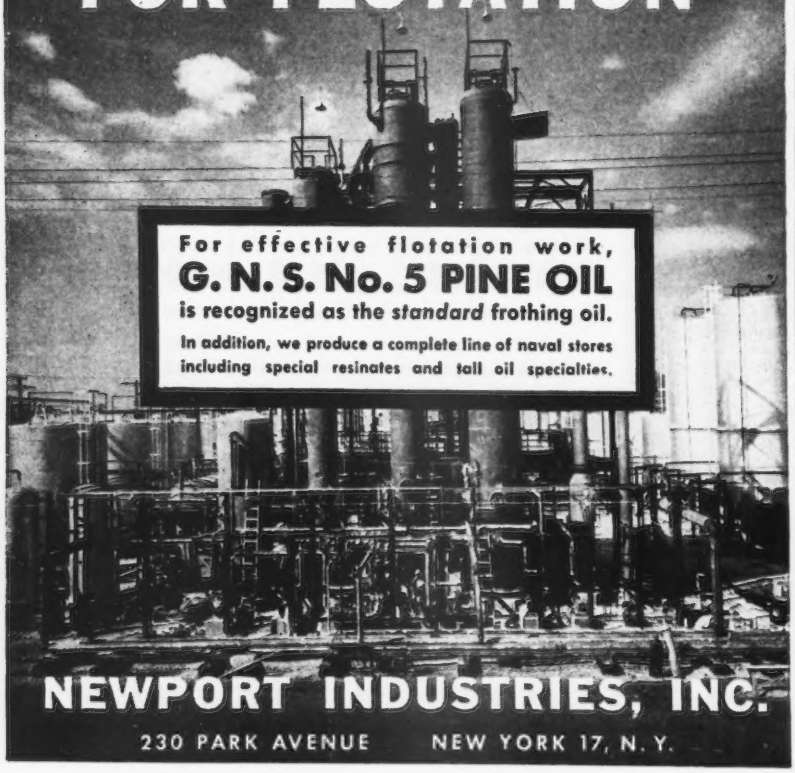
DIVISION OF B-I-F INDUSTRIES, INC.
METERS FEEDERS CONTROLS

FOR FLOTATION



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is recognized as the *standard* frothing oil.
In addition, we produce a complete line of naval stores including special resinates and tall oil specialties.

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Austria *(Continued)*

brings to two the number of active copper mining companies in Salzburg Province. The other operation, Mitterberger Copper Mining Co., a nationalized enterprise, is located near Muehlbach at the Hochkoenig Peak.

Kaiserberg Graphite Mine Co., of Styria, has developed a flotation method to recover fine-grain graphite powder from coarse-crystal raw material. This development is expected to make Austria self-sufficient in fine grain graphite. Heretofore, Austria imported this commodity, primarily from Bavaria, Ceylon and Madagascar.

The Kaiserberg mill is now producing graphite with a carbon content of 90% with a grind of 10 microns or smaller. During 1954, Kaiserberg plans to open a chemical branch where up to 99% carbon can be concentrated in the 10-micron powder. A third kind of graphite powder will be the heat and fire-resistant type, with carbon content ranging from 83-86%.

POLAND

Polish geologists, led by a Dr. Pavlovski, reportedly have discovered a large deposit of sulphur in Poland. Since deposits discovered heretofore have been small, and the domestic need has been great, the Poles reportedly are in a hurry to realize production from the new deposit. Exploitation is to begin this year.

Warsaw Radio announced that a new copper mine near Boleslawec is now in production. It is expected that by the end of 1954, about 100 tons will have been produced. Full operation is expected within the next three years.

ITALY

Board of Directors of Montecatini Co., which controls many Italian mines, recently gave shareholders a diverse picture of the Italian mining industry. At a general meeting, the board gave these reports:

Pyrites: In 1953, Italian output of pyrites rose to 1,225,000 tons as against 1,141,454 for 1952. Of the 1953 total, 1,050,158 tons were produced by Montecatini mines, which in 1952 had produced 970,629 tons.

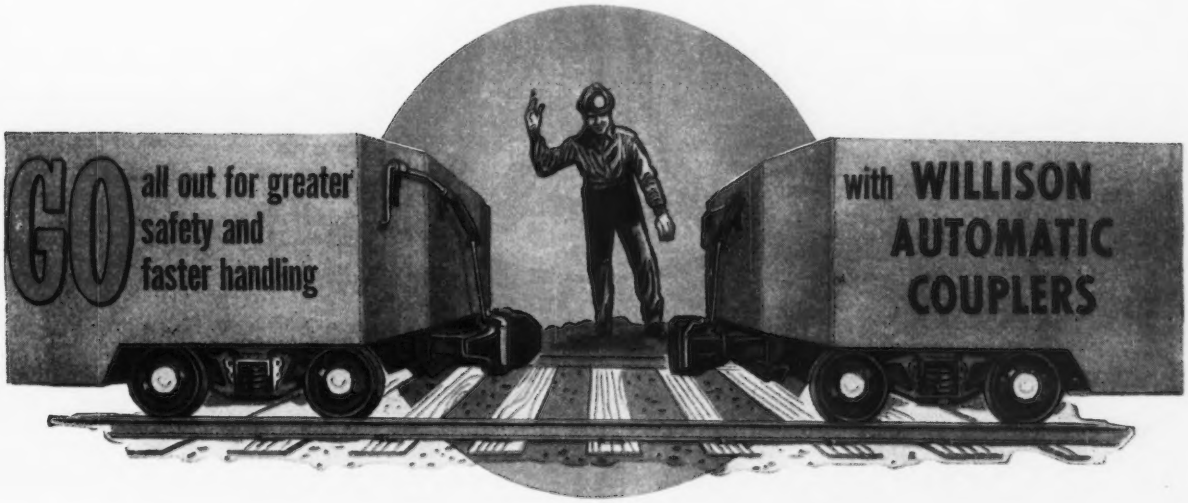
Increased production was attributed to greater mechanization, particularly in mines of the Maremma.

At Gavorrano, a discharge tunnel has been built and schists have been prepared for working.

A flotation plant at Fenice Capanne mines has begun operation and is producing blende and galena as well as calcium-pyrites.

At Bocheggiano, it is expected that a drainage tunnel now in the works will be completed before the end of 1954.

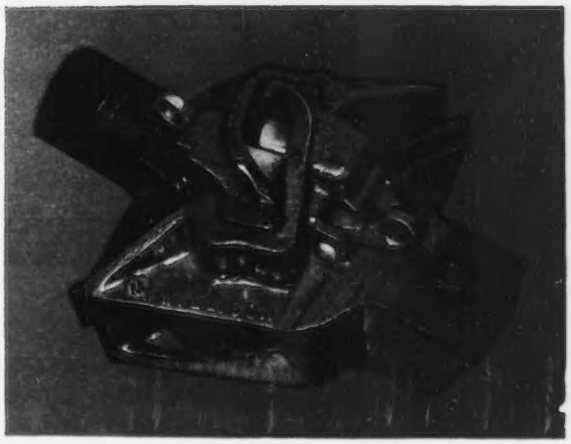
The Montecatini board said also that active prospecting has brought satisfactory results. New beds of pyrites have been found in the Maremma. Prospect-



With Willison Automatic Couplers there's no need for personnel to go between cars to couple or uncouple. That means safety—and faster handling because Willisons uncouple from either side. All Willisons couple with each other automatically—there's no matching of coupler heads.

For safety, faster handling and larger tonnages—Willison Automatic Couplers and National Multi-Pad Rubber Draft Gears.

A-9031



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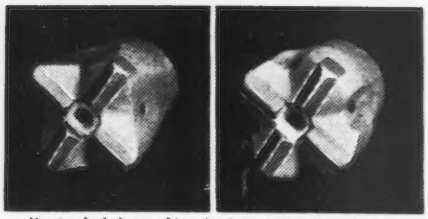
NON-RIFLING
Carbide Rok-Bits



Unretouched photos of bits that have drilled similar footage

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Carbide Rok-Bits—cross or chisel types—gage sizes: 1¼" thru 4".
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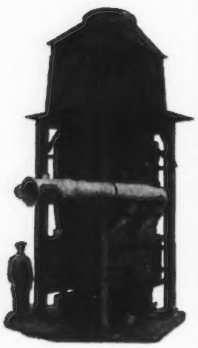

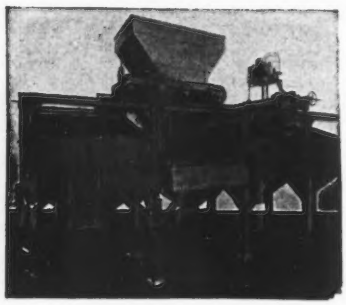

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Italy *(Continued)*

ing in Elba also has been encouraging. In the latter half of 1953, Montecatini took over Manganesifera Italiana Co. which owned calcium pyrites and manganese deposits in the Sestri Levante area.

Sulphur: While the Sicilian sulphur industry is depressed generally, new mining enterprises are being undertaken. At the mines of Passarello and Bosco, work was begun on a small scale in 1953 and is now being stepped up.

Plans have been made for erecting at Passarello a modern plant for treatment of ores by a reportedly new process.

Bauxite: In 1953 the Montecatini mined 257,000 tons of bauxite as compared with 252,000 tons in 1952. The totals include output of mines at Caiazzo (Caserta), which began operation in 1952. Output of the Caiazzo mines rose from 4000 tons in 1952 to nearly 15,000 tons in 1953.

Blende & Galena: Italian output of blende and galena in 1953 amounted to 210,000 tons and 65,000 tons, respectively, a slight increase over 1952 figures.

Total output of the associated Company Montevecchio Società Italiana del Piombo e dello Zinco amounted to 34,230 tons of blende and 21,580 tons of galena. Preparations are being made for regular working of the Accessa Mine.

IN SCANDINAVIA

NORWAY

A new aluminum plant with an annual capacity of 40,000 tons went into operation in June at Sunndalsoera. Full capacity is expected to be reached by the end of 1955.

Norway's Electro-Chemical Corp. indicated that it planned further expansion of aluminum production during 1954. The firm said that its aluminum smelting activity was larger in 1953 than in any previous year.

The company added that it has worked out a new method for test-reduction on a small scale which gives the needed basis for dimensioning of electric blast furnaces on a full industrial scale.

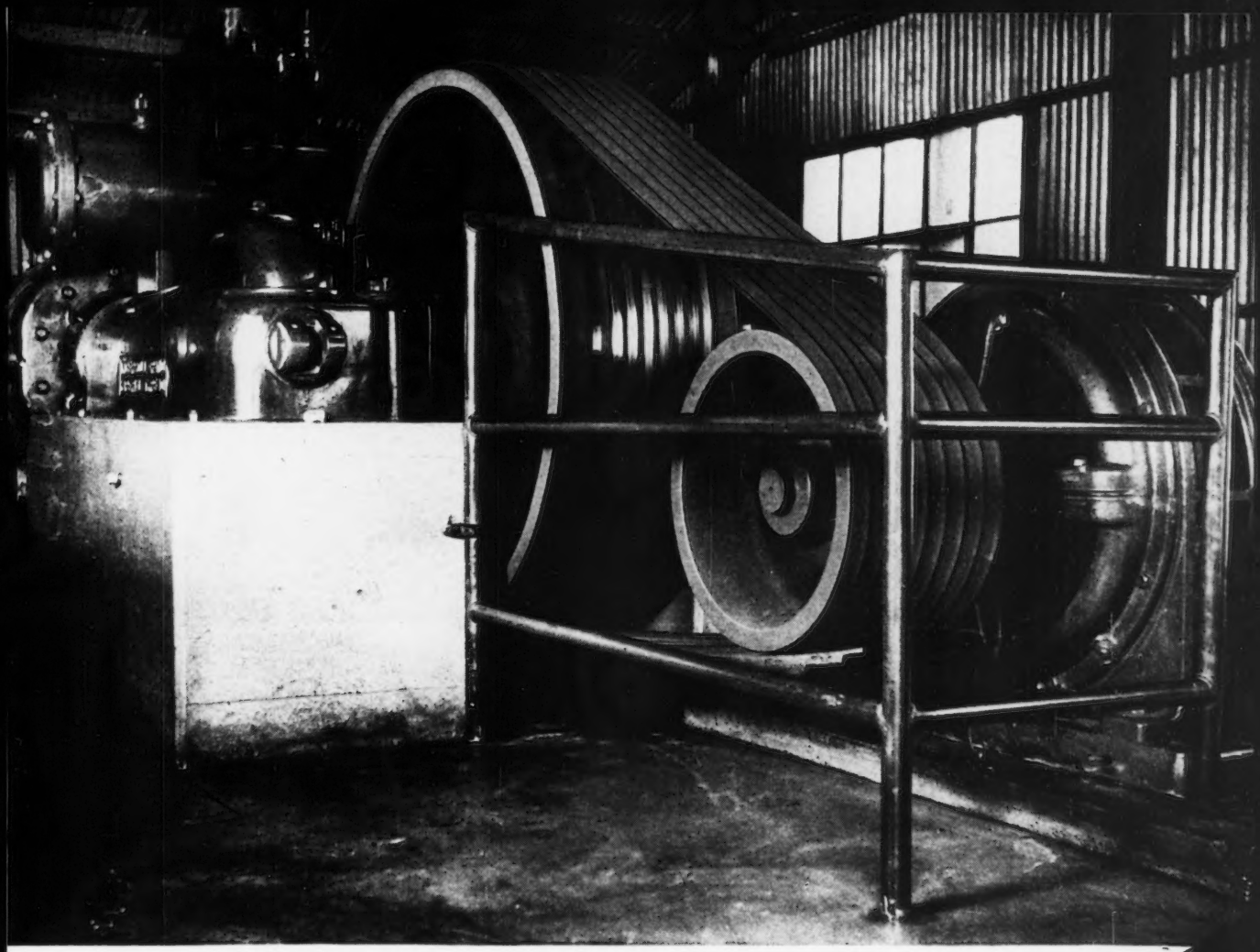
SWEDEN

Sweden's first atomic reactor is nearing completion and is expected to begin functioning shortly. It will contain 3 tons of uranium and will be moderated by heavy water.

Uranium rods were supplied by the French atomic energy agency and Sweden, in return, is sending France uranium oxide, extracted from shale deposits near Orebro, just west of Stockholm.

This present, 100 kw reactor has been built near the Stockholm Institute of Technology on the outskirts of the capital. It is in an underground chamber

(*Continued on p 168*)



Thermoid Multi-V Belts cut operating costs

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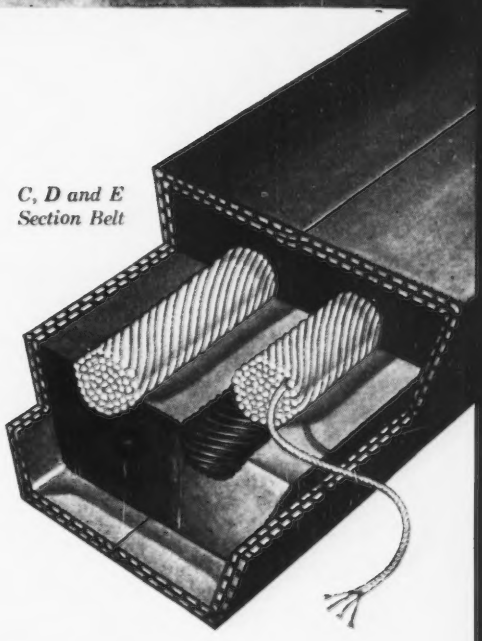

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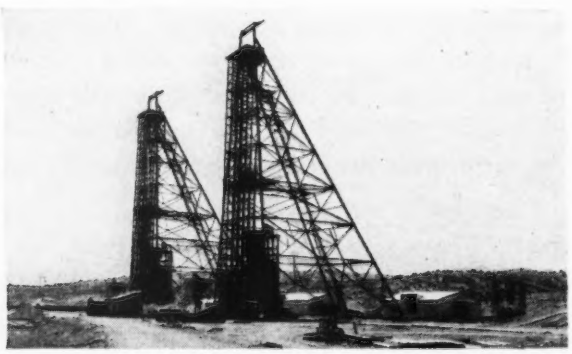
MORENCI Reduction Works accounted for a major portion of Phelps Dodge's 1953 production of 447,108,344 lb. At Morenci last year, the concentrator handled 16,119,028 tons of ore; the smelter treated 504,211 tons of concentrates.

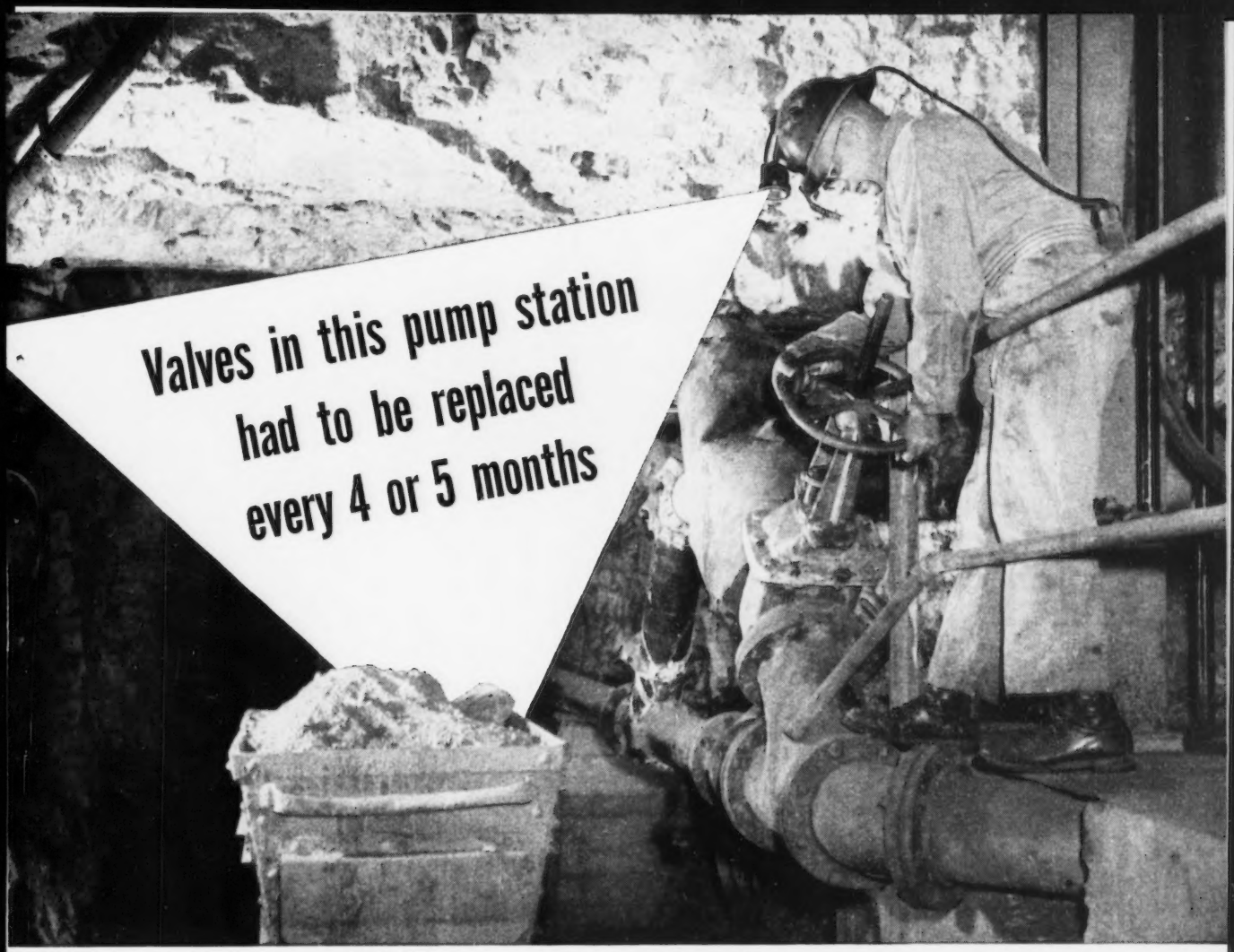
Four Reasons Why Arizona Is Top Copper State

MIAMI Copper Co.'s shaft, crushing plant and concentrator at Miami are now handling some 12,500 tons of ore daily.

INSPIRATION Consolidated Copper Co.'s Live Oak Pit at Inspiration is being prepared for glory-hole mining as practiced at Inspiration's nearby Thornton Pit.



NEW steel headframes loom over main production shafts at San Manuel Copper Corp.'s property at Tiger Shafts. The shafts will be sunk to 1800 ft, now are down more than 300 ft.



PLANT CHIEF HAROLD STIENMIER adjusts a Stainless Steel valve on eight-inch pipe carrying corrosive mineral waters deep inside the Gilman, Colo. mine of Empire Zinc Division.

until Stainless Steel took over the job

HIGHLY mineralized and extremely corrosive water took its toll of mine pump valves at the Gilman, Colo. operation of Empire Zinc Division, The New Jersey Zinc Company, until Stainless Steel provided a lasting answer to the problem.

Harold Stienmier, plant chief at the Gilman operation, tells the story: "Mild steel brass-trimmed valves were having to be replaced every four or five months due to corrosion from the mine waters. We started replacing them with Stainless Steel valves and they are as good as the day we put them in."

"The day we put them in" was 1944 in some cases . . . making them 10 years old. So, even though Stainless valves cost three times as much as valves formerly used, they paid for themselves the first year and have given nine years of almost cost-free service since.

This is but one of many cases where Stainless Steel has proved beyond doubt that it is the most economical material you can use where corrosion and abrasion present a problem. It is a versatile material, able to handle all kinds of jobs and handle them well.

If you have spots in your equipment where premature failure is adding to your production costs, give Stainless Steel a trial. And when you do, be sure it is perfected, service-tested USS Stainless Steel.

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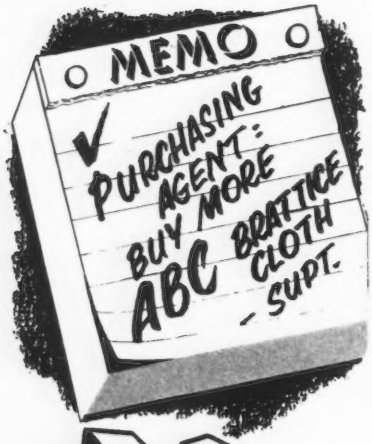
4-1465

UNITED STATES STEEL



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1. A.B.C. BRATTICE CLOTH is made from select fabrics, carefully processed to resist flame and mildew.
2. A.B.C. BRATTICE CLOTH is produced and processed in a modern mill. Workers are highly skilled and have long experience.
3. A.B.C. BRATTICE CLOTH is used in mines all over the U. S. and many foreign countries. Has a remarkable record of performance.
4. A.B.C. BRATTICE CLOTH is available from stock in seven types, nine widths and three lengths. There's a size and type to meet every need.
5. A.B.C. BRATTICE CLOTH is easy to hang in any type mine . . . any thickness of seam.

An A.B.C. Development, ideal for temporary stopping in both coal and metal mines. Made to fit any opening and contour. Quickly erected with minimum of man power . . . deflating and removal just as simple. Write for complete new catalog on A.B.C. Mine Ventilation Supplies!

A B C AMERICAN BRATTICE CLOTH CORP.
220 S. BUFFALO STREET
WARSAW, INDIANA

Sweden *(Continued)*

hewn out of the bedrock on which the city rests.

The chamber extends about 100 ft below the surface and is covered by 50 ft of granite. The reactor is surrounded by protective shields consisting of 60 tons of graphite, aluminum plates and cadmium sheets, and 1500 tons of cement mixed with iron ore. Sweden plans also the construction of a 20,000-kw reactor.

IN THE PHILIPPINES

Elizalde & Co. reportedly is planning to build a major industrial explosives plant in the Philippines.

Jesus Cabarrus, one of Elizalde's vice presidents, recently returned from discussions in the United States and Europe. He held detailed discussions with Vassac Chemical Works of Essen, Germany. Basic raw materials, glycerine and nitric acid, are available in these Islands.

Also, Elizalde is reported to be planning a sintering plant for beneficiation of chrome and iron ores. The firm has just opened a chemical research laboratory in Tanduay, Manila.

Passage by the Phillippine Congress of a gold subsidy bill has given a welcome boost to the free market for newly-mined gold. President Magsaysay was expected to sign the bill into law.

The measure would extend direct financial assistance to gold mines through a guaranteed floor price. The going-price of P104.50 has gone up to around P110.

With the operation of the subsidy program, private buyers of gold would be forced to bid higher than the subsidy price at which the government will buy newly-mined gold. This price would be set so as to allow mines a modest profit.

IN ASIA

MALAYA

More than 10% of Malaya's tin dredges have had to close down because of lack of ore reserves. Dredging produced 51% of Malaya's tin last year.

At the peak, there had been 95 dredges operating. In May, this number had been reduced to 76. Land has been worked out and there reportedly is little immediate prospect of acquiring new land because of prospecting restrictions.

G. F. Gripper, Malaya Federation's chief inspector of mines, said, however, that the government is considering action to improve prospecting conditions.

Biggest current prospecting operation was reported to be in the Kroh Forest reserve in Perak. In this area, the government has provided armed protection for several mining companies searching for tin.

PQ® Silicates are efficient in recovering complex ores of low concentration values. In one fluorspar operation recovery was above 95% using 1.2 lbs. of N® Silicate (ratio 1:3.22, 41° Baume).

May we discuss the use of a PQ® Silicate in your beneficiation system?

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PQ® Silicates of Soda
METSO® DETERGENTS

Kleenslot
SCREEN GUARDS
The screen guard is built into the screen and the guard bars permit only the finer particles to pass over the screen. All sizes and most materials furnished.

Cross section at left shows how KLEENSLOT Screens operate on a non-clogging principle.

Wedge Wire KLEENSLOT screen guards can be furnished in special sizes to your requirements in practically any type of long wearing metal. They are made to close tolerances like all Wedge Wire products—the width of each wire is held to plus or minus .002 to insure uniform opening width. All Wedge Wire features are embodied in these screen guards and it is to your advantage to consider them from the standpoint that they are non-clogging, non-blinding, strong, rigid uniform and more economical in the long run.

SEND FOR OUR ILLUSTRATED LITERATURE

Wedge-Wire CORPORATION
GAS ST. AT NICKEL PLATE R.R.
WELLINGTON, OHIO

Use *Denver "Sub-A" Flotation Machines* for Roughing, Scavenging and Cleaning

DENVER "SUB-A'S" RECOVERING NICKEL: In Canada, Denver "Sub-A's" play an important part in processing 40,000 tons a day of nickel-copper ore. Here are several of the 552 No. 30 (56x56) Denver "Sub-A" Flotation Cells operated by this company. Denver "Sub-A" Flotation was selected after extensive tests. Denver "Sub-A" Flotation is standard in practically all copper-nickel mills.

High Economic Recovery

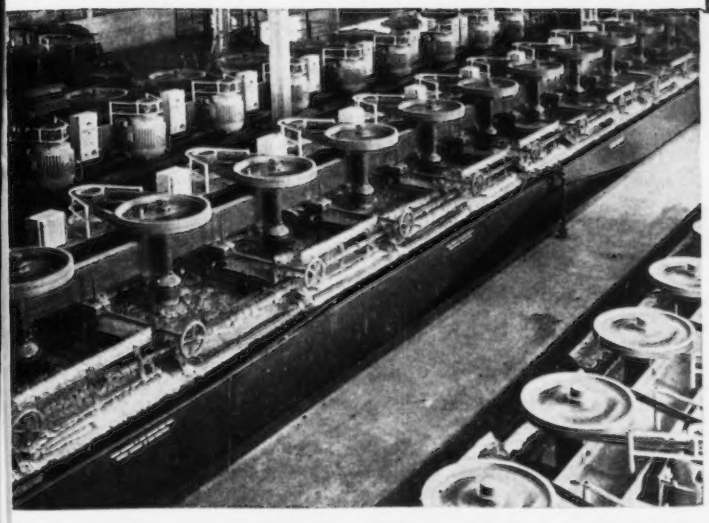
More large plants are recognizing the importance of installing Denver "Sub-A's" for their entire flotation job—roughing, scavenging, cleaning and re-cleaning. This practice results in maximum recovery and lowest cost per ton of ore treated.

DENVER "SUB-A'S" RECOVERING COPPER: Here 5000 tons of copper ore per day are processed in 120 No. 30 (56x56) and 32 No. 24 (43x43) Denver "Sub-A" Flotation Cells. These cells were installed for both roughing and cleaning after a series of competitive tests with other flotation machines.

High Grade Concentrate

Denver "Sub-A's" are recognized the world over for their ability to produce high grade selective concentrates.

DENVER "SUB-A'S" RECOVERING LEAD AND ZINC: Denver "Sub-A" Flotation Cells in large Australian lead-zinc mill. Lead rougher flotation is accomplished in a 12-cell No. 30 (56x56) Denver "Sub-A" and cleaning is done in a 10-cell No. 24 (43x43) Denver "Sub-A." Zinc flotation is performed with identical units.



Low Maintenance and Power Cost

The Denver "Sub-A" is easy to maintain. Many operators report wearing life of parts of 2 to 15 years. Power is low and used efficiently. No pumps are required to recirculate froth and middlings in the cleaning circuits.

For further details on improving your flotation circuit, please write to DENVER EQUIPMENT COMPANY, 1400 17th St., Denver 17, Colorado, phone CHerry 4-4466.

DECO FLOTATION ENGINEERING — DENVER EQUIPMENT 24 HOUR SERVICE COMPANY

Complete Mill Equipment. You have one manufacturer—one responsibility.

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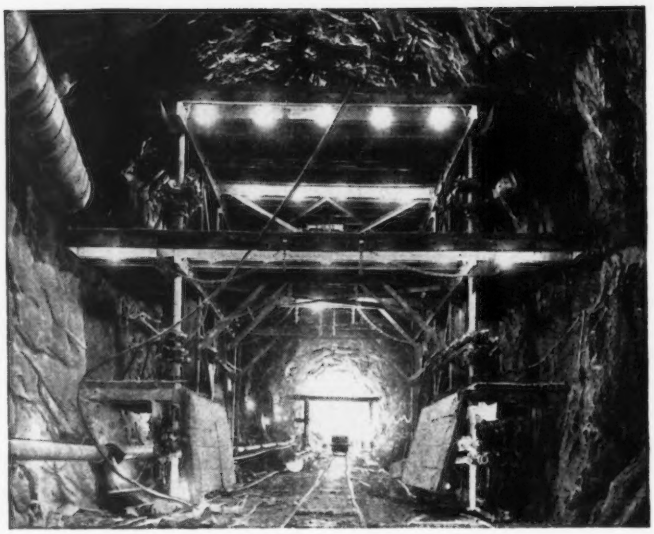
DENVER EQUIPMENT 24 HOUR SERVICE COMPANY

STANDARD RELIABLE 24 HOUR SERVICE EFFICIENT

Helped set new tunneling record — Rock drills using I-R Carset Jackbits helped the contractor, Morrison-Knudsen, drive this 25'-diameter tunnel 10.1 miles in record time. Constructed for the Aluminum Company of Canada, it was pushed forward an average 47' per day during one 6 day week, thus exceeding the previous record for a bore of this size by about 7' per day. Water conveyed through it, from Lake Tahtsa, will provide the source for electrical power at Kemano to refine aluminum ore at the Alcan Aluminum Smelter at Kitimat, British Columbia, Canada.



Nickel Alloy Steel Body of the Carset Jackbit

Carset Jackbit with carbide cutting edges set in 2% nickel alloy steel body. This specially developed steel, patented and produced by Crucible Steel Co. of America, Pittsburgh, Pa., is sold under the tradename "HY-Tuf." Low notch sensitivity and good notch impact properties at high hardness led to the selection of "HY-Tuf" by Ingersoll-Rand Co., New York, N. Y., producer of Carset Jackbits.

Retains Inserts under terrific Pounding

Resists Cracking and Deforming

Carbide cutting edges that readily cut through the hardest rock have helped Carset Jackbits set remarkable performance records.

But, no ordinary steel body can hold these carbide inserts securely. Nor can it resist deforming or cracking under the terrific pounding of heavy rock drills that strike 2,000 blows per minute.

To solve the problem, Ingersoll-Rand Company . . . producer of Carset Jackbits . . . fabricates the body from an alloyed steel containing 2% nickel. Combining great toughness and high strength, this unit exemplifies how desired combinations of strength, hardness, toughness, ductility and other useful properties can be developed together in a single nickel alloy steel composition . . . to improve the performance and economy of a product to meet a specific requirement.

From among the many standard nickel alloy steels available, you can select one which provides the best set of properties for meeting virtually any fabrication or service demand.

Whatever your industry, investigate how nickel alloy steels can improve your products or equipment. If you have a metal problem, send details for our suggestions. Write today.

EMBLEM OF INCO SERVICE

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

CHINA

Nation-wide survey of mineral resources by 43 Chinese geology teams got underway in mid-June.

INDIA

Indian manganese industry reportedly is suffering from a lack of overseas demand. Operations in mines producing second and third-grade ores have been drastically curtailed.

KOREA

Plans to sell all state-owned mines, except the two largest tungsten mines, have been announced by Ahn Tong Hyok, South Korean Minister for Commerce & Industry. The sales program is part of a planned disposal of state-managed enterprises.

In all, 391 gold, silver, copper, lead, zinc, tungsten, molybdenum, graphite, kaolin, fluorspar, anthracite and lignite mines would be sold under an installment plan, the Minister said.

New mineral deposits have been discovered in North Korea, the *New China News Agency* reported. Mineral deposits found by 36 prospecting teams reportedly include large amounts of copper, nickel and other ores in North Hamkyong Province and considerable quantities of molybdenite and coking coal elsewhere.

Annual Reports Digest

International Nickel Company of Canada Ltd. reported net earnings in 1953 of $53-694,526 as compared with $58,891,282 for 1952. Decline of about 9% was due principally to the generally higher costs of labor and materials and to increased provision for depreciation. Sales in 1953 set a new record at $338,579,995, an increase of about $24-million over the peak reached in 1952.

In 1953, Inco operated at peak production for the fourth successive year. At year's end, Inco increased its annual capacity and production rate by 24-million lb of nickel and 20-million lb of copper through changes in operations.

These changes were made possible by a special mining program and by Inco's perfecting a new process for recovery of nickel from pyrrhotite in ores with simultaneous recovery of a high-grade iron ore. As part of this operation, Inco is stockpiling pyrrhotite for treatment in a new plant now being built. Inco expects ultimately to recover 1-million tons of by-product iron annually.

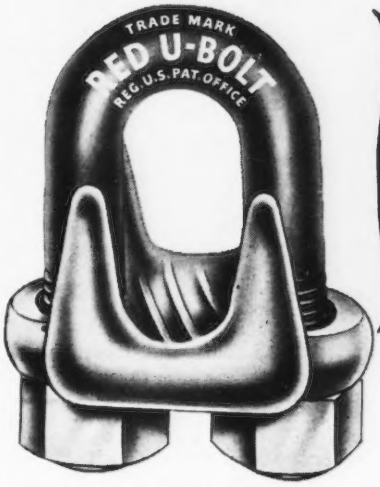
Inco is selling its increased nickel and copper production to the U. S. Government under a five-year contract which began in January 1954 and is to be completed in 1958. Total deliveries of nickel in all forms during 1953 amounted to 251,417,772 lb.

Proven ore reserves stood at 261,541,-

GENUINE

CROSBY CLIPS

THE NAME THAT GUARANTEES QUALITY



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WORLD'S LARGEST MANUFACTURERS OF PORTABLE RADIATION INSTRUMENTS

CONTINUOUS MINING?

Want 6 hours or more actual loading time per shift?

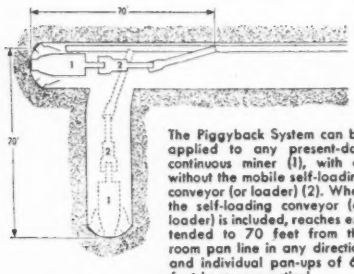
LONG PIGGYBACK® CONVEYOR SYSTEM

By actual time studies, up to six hours loading time per shift is not unusual with the Long Piggyback* System—even when it is operated with mobile loaders in two or more rooms.

This unique system offers the same advantages when used with any type continuous mining machine. The Long System utilizes practical, low-investment, low-maintenance chain conveyor equipment that has been proven in service. With the Piggyback System, enough potential advance can often be provided to allow operation of an entire shift without interruption.

*Trade Mark

THE LONG PIGGYBACK SYSTEM FOR CONTINUOUS MINING



The Piggyback System can be applied to any present-day continuous miner (1), with or without the mobile self-loading conveyor (or loader) (2). When the self-loading conveyor (or loader) is included, reaches extended to 70 feet from the room pan line in any direction and individual pan-ups of 60 feet become practical.

WANT MORE DETAILS OR A DEMONSTRATION? WRITE US TODAY.

The **LONG** Company

OAK HILL, W. VA.

Formerly Long Super Mine Car Co.

Annual Reports *(Continued)*

259 short tons on Dec. 31, 1953. This compares with 256,355,903 short tons at the end of 1952. The nickel-copper content at year's end was 7,816,669 short tons, compared with 7,795,326 short tons at the end of 1952.

In search for new sources of nickel, Inco in 1953 spent $6,084,742, believed to be the largest expenditure for exploration in any year by any mining company in Canada. In 1952, $4,967,450 was spent.

Through this exploration program, Inco in 1953 was able to replace the 13,667,000 tons which were mined and to add to its reserves an additional 5,185,000, making a total of 18,852,000 tons of ore resources added for the one year.

Other highlights of Inco's year included boosting the capacity of its Creighton concentrator from 10,000 to 12,000 tons per day and also the use throughout the year of large-scale oxygen flash smelting of copper.

American Zinc, Lead & Smelting Co.'s annual report reflected, as did many others, the low prices for lead and zinc. For 1953, this company reported net income of $1,626,262, compared with $2,657,618 for 1952 and $3,394,884 for 1951. Sales and other income amounted 1953 to $68,396,799 as against $79,793,391 for 1952, a decrease of 14.28%.

Principal reason for the decline—during a period of record consumption—was ascribed to foreign imports of slab zinc which flowed into the United States in unprecedented volume during 1953.

These imports totaled approximately 230,000 tons or between 20-25% of the total domestic consumption, the annual report stated. This situation caused a surplus and during the year stocks of slab zinc in the hands of producers increased some 93,000 tons, the report said.

Steep Rock Iron Mines Ltd. in 1953 enjoyed the most successful year in its history. Shipments of 1,301,688 tons of high grade iron ore brought a net profit of $3,450,000.

During 1953, open pit mining began on Steep Rock's Hogarth orebody and underground mining got underway at the company's Errington orebody. Open pit mining on the Errington orebody was completed. Steep Rock's large scale development program contemplates an annual productive capacity of 3.5-million tons for these two new mines alone.

Steep Rock spent a total of $10,210,000 during 1953 on plant, equipment and development work under its expansion program which is aimed at sustaining annual production of 5.5-million tons.

The Steep Rock iron range has about 7 mi of contact zone favorable for iron ore deposition. Exploration to date along 3½ mi of this zone has resulted in discovery of four large orebodies having an annual production potential of 8.5-million to 10-million tons.

Vanadium Corporation of America's 1953 sales of $43,278,701 and net earnings of $3,014,903 were the highest in the company's history. In addition, the Vanadium corporation during 1953 virtually completed its expansion, improve-

(Continued on p 175)

WEIGH WITHOUT STOPPING

WHILE YOU **CONVEY**

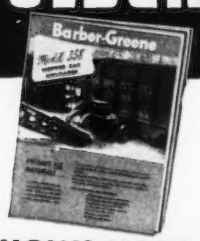
Yes, weigh and record with the —MERRICK

WEIGHTOMETER

The Merrick Weightometer provides a continuous, automatic, accurate weight record at any designated point in the mill, while material is in motion on conveyor. It weighs without interrupting conveyor service. Applicable to any size belt conveyor, horizontal or inclined. An accurate and dependable means of keeping constant check on production.

MERRICK SCALE MFG. CO. PASSAIC N. J.

This Barber-Greene **FOLDER**



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1 man can move
3 tons of material in
60 seconds with
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New *simplicity and sustained efficiency in dust filtering and collection . . .*

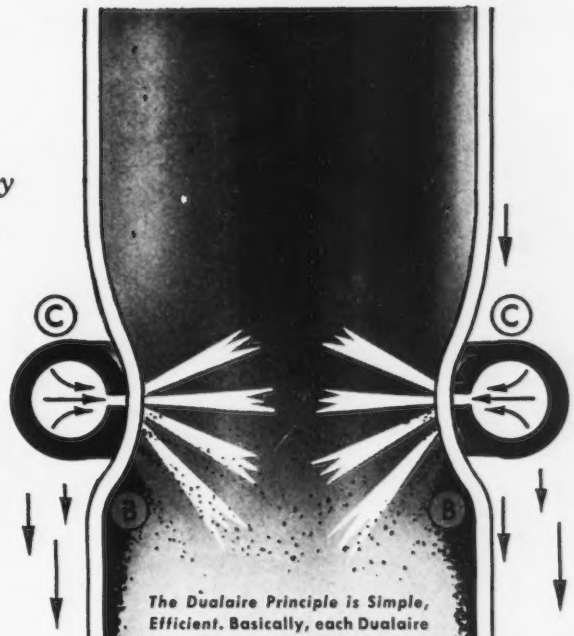
Dualaire*

REVERSE-JET DUST COLLECTOR

Efficiencies up to 99.99%

Cloth filter systems of one design or another have long been used by industry for cleaning industrial gases and/or recovering dust or other suspensions. But three problems are common to such systems... (1) Extreme changes in pressure drop and filtering efficiency as dust cakes accumulate on the filter surface... (2) Wide pressure fluctuations and surges in the plant system as filter units become clogged or are cut out and rapped for cleaning... and (3) Rapid deterioration of the filter material by the vibration, shaking and rapping equipment used for cleaning.

But now the DUALAIRE Collector—as engineered by Western Precipitation, pioneers in the field of dust recovery—provides the answer to these and other problems common to conventional bag-house equipment.



The Dualaire Principle is Simple, Efficient. Basically, each Dualaire filter unit consists of a cloth or felt tube, open at both the top and bottom. (A) Dust-laden gases enter at top of the tube and are filtered as they pass through the side walls of the tube to the exhaust system. (B) Dust particles collect on the inside of the tube and *before* the cake builds up sufficiently to affect filter operation, a tubular blow ring (C) automatically starts moving up and down the outside of the filter cylinder. A jet of air, concentrated by this blow ring, reverses the normal gas flow at the point contacted by the ring, thus jetting the dust layer off of the inner surface of the filter tube.

This jetting action is further assisted by a flexing of the filter cylinder as the blow ring passes, thus cracking and loosening the dust layer from the inner surface, from where it drops to the recovery chamber below the bottom of the tube.

The entire operation is positive and simple. The blow ring starts its action *automatically* as soon as the dust layer causes a pre-determined pressure differential. And after the filter surface is cleaned, the blow ring *automatically* stops.

6 ADVANTAGES OF DUALAIRE DESIGN...

PRESSURE DROP remains uniformly low at all times because the dust is removed continuously in *small portions.*

FILTERING EFFICIENCY remains uniformly high at all times without the "choking" action characteristic of conventional bag-houses. Actual field tests show efficiencies as high as 99.99%!

DUST RECOVERY is in steady increments — not in sudden large "batches" as with conventional rapping systems. Thus the Dualaire eliminates surges and detrimental variations in the plant system.

FILTER ELEMENT has a much longer life because it is not subjected to the stresses of rapping or jarring while being cleaned. Dualaire reverse-jet cleaning action is gentle, yet far more effective.

GREAT SAVINGS are also made in space and the size of installation required. Because each Dualaire filter unit is cleaned more-or-less constantly without shut-down, there is no need for costly standby units — or the complicated switching equipment to cut standby equipment in and out.

BASIC UNITS are "sectionalized" and are available in 5 standard heights. Sections can be bolted together in any desired multiple, providing a capacity range to fit virtually any requirement. As needs increase, add more sections.

There are many other advantages built into the DUALAIRE. *For further details send for this descriptive 12 page booklet. Or contact your nearest Western Precipitation representative!*

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THE SYMBOL of a GOOD NAME

GOOD MACHINES and GOOD SERVICE throughout the world

You get more—much more—than a machine when you buy a MARION. Some of the other important benefits for you:

A GOOD NAME—Since 1884, MARION has been a trusted name in excavating machinery.

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from ¾ cu. yd. to 45 cu. yds.

OFFICES AND WAREHOUSES IN ALL PRINCIPAL CITIES

Annual Reports *(Continued)*

ment and diversification projects undertaken the past four years.

The Corporation mines vanadium not only at its properties (Mina Ragra) 15,600 ft above sea level in the Peruvian Andes but also on the Colorado Plateau. Chromium ore is mined from company-owned deposits in Southern Rhodesia and is purchased from other sources.

Among other expansion projects, a new mill to concentrate eluvial and metallurgical-grade chrome ore was placed in operation last December at the Vanad Mine. This mine is operated by Rhodesian Vanadium Corp., a wholly-owned subsidiary.

In addition, Vanadium Corporation of America exercised ts option to purchase the mill at Durango, Colo., which it had previously operated under lease from AEC.

Efforts to recover chromium ore from ferrochromium slags were continued.

Kennecott Copper Corp. and its subsidiaries' consolidated gross revenues of $482,807,936 last year were the highest in the corporation's history. Net income in 1953 was $88,753,873 as compared with $86,150,718 reported for 1952.

A total of 56,147,321 short tons of ore was mined by the five mining divisions of Kennecott; this figure in 1952 amounted to 59,015,190 tons. Total copper produced in 1953 was 569,399 tons as compared with 629,394 tons in 1952, a decrease of 9½%. The mining divisions are Chino Mines, Nevada Mines, Ray Mines and Utah Copper in the United States and the Braden Copper Co. in Chile.

Of the total copper produced by Kennecott last year, 75% came from domestic divisions and 25% from the Chilean division. In 1952, these figures were 70%-30%.

Kennecott's research program included several projects which have been brought to readiness for pilot scale evaluation and development. Among those projects were:

- A method to increase the percentage of copper recovered from Arizona and New Mexico ores;
- Work on a small pilot plant at the Chino Mines Division to determine the feasability of leaching unrecovered copper from flotation process tailings;
- Work on greater gold recovery at the Utah Copper Division;
- Study of the use of micro-organisms in improving the leaching of copper and other metals from their ores.

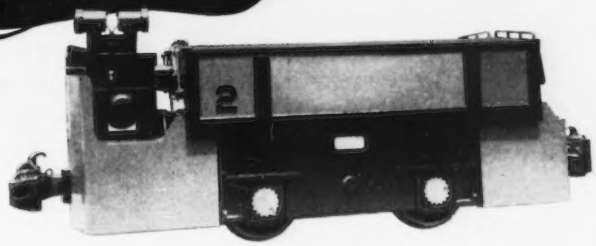
Quemont Mining Corp. Ltd. reported net income for 1953 of $3,056,480 as against $4,272,712 for 1952. Decline in profits was ascribed mainly to a strike which began Oct. 2 and continued through the remainder of the year. This strike was not terminated until Feb. 16 of this year.

Renabie Mines Ltd., Toronto, realized net profit of $303,097.04. Renabie too, received aid under the Canadian Emergency Gold Mining Assistance Act.

The Beryllium Corp., Reading, Pa., reported net income of $591,191 as against that for 1952 of $642,287.

GREENSBURG EIGHT TON MONITOR
Storage Battery Locomotives

...for top performance "Double Equalizers" make the difference



The Greensburg 8 ton Monitor is equipped with two glass insulated motors, contactor type controller and double equalizers. These double equalizers make the difference in performance . . . more tractive effort, better brakes, better riding qualities and longer battery life than any other storage battery locomotive of equal weight and battery capacity!

All Greensburg locomotives are Custom-Built to meet your requirements in both single and double motor drive with drum, cam or contactor type controllers.

For more earning power per invested dollar specify Greensburg Storage Battery Locomotives.

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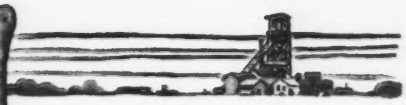

Compare Bemis Waterproof (*laminated-textile*) Ore Bags with the shipping containers you are now using . . . for economy, durability, convenience. Make comparative tests. Send for details and sample bag.

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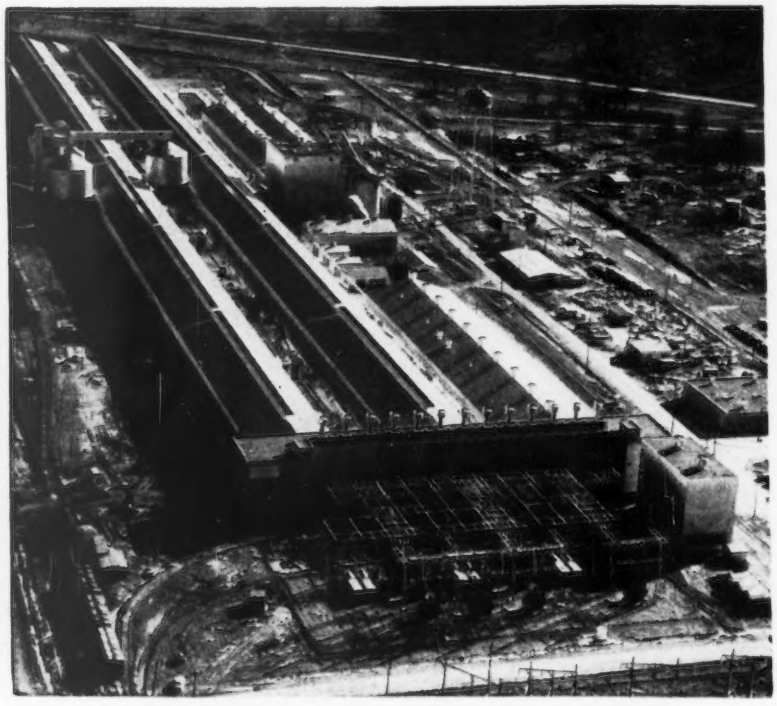
Climax Is Now North America's Largest Underground Mine

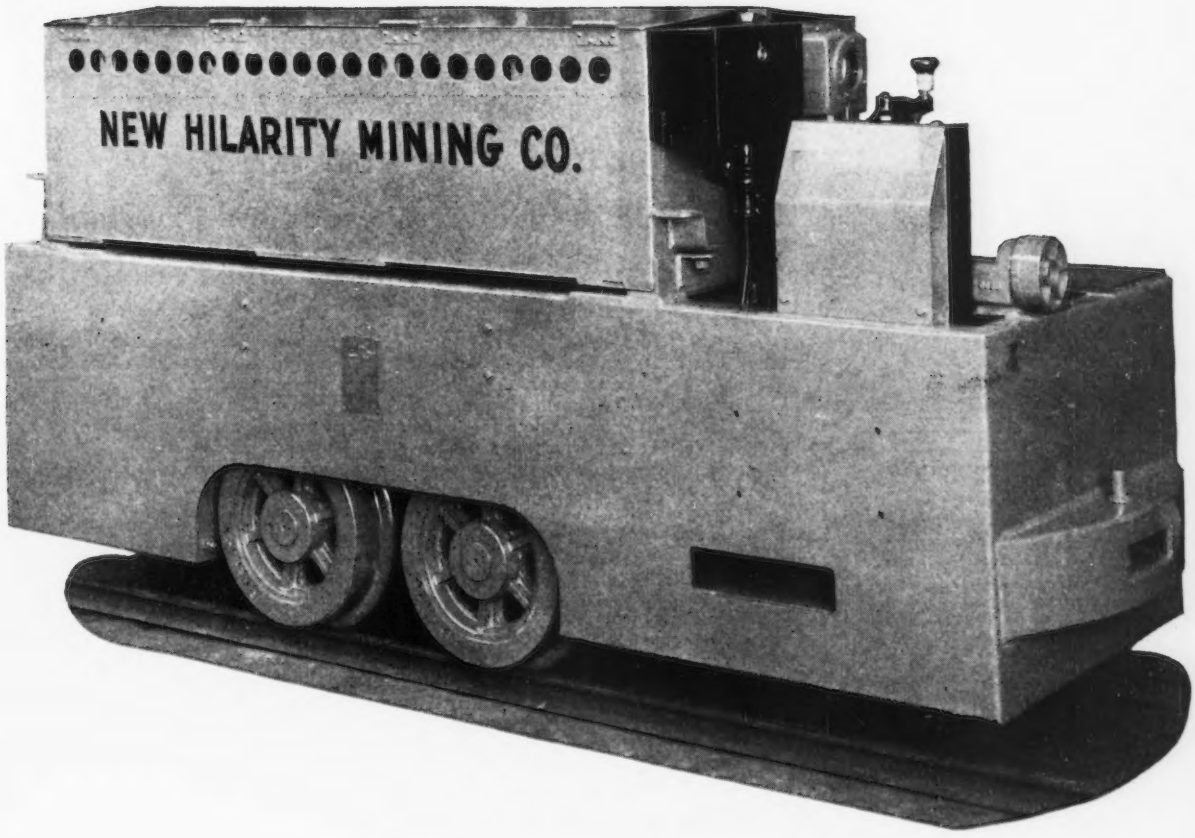
Climax Molybdenum Co.'s mine at Climax, Colo., is now the largest underground mine in North America, according to Arthur H. Bunker, company president. Bunker bases that claim on the daily production rate of 27,000 tons of ore, reached late in January. Previous record holder was the Robena coal mine of U. S. Steel, in Greene County, Pa., which held the title for more than six years with a daily rate of 24,500 tons. The Climax orebody is the largest primary source of molybdenum in the world. This year it will supply about two-thirds of that metal produced this side of the Iron Curtain. Published sources estimate Soviet Production at less than one-fortieth of that of the Free World. Free World output of molybdenum in 1954 will be more than 65-million lb.



Reynolds' New Patterson Plant Is Nearing Full Output

REYNOLDS METALS CO.'S Robert P. Patterson Plant at Arkadelphia, Ark., is heading into full capacity of 55,000 tons of aluminum annually. Production got underway at the $34-million plant late in January. Potrooms are 1827 ft long, housing large Söderburg pots. Plant employs 400 workers. J. W. Hutchison is plant manager. Alumina is obtained primarily from Hurricane Creek, Ark.

ATLAS
Heavy Duty
TRAMMER



ATLAS 3-TON TYPE K
STORAGE BATTERY LOCOMOTIVE

SOLD IN CANADA by Mine Equipment Co., Ltd., Kirkland Lake, Ontario; International Agencies & Machinery Co., Ltd., Vancouver, B. C. SOLD IN SOUTH AFRICA by Universal Mechanisation Co. (Pty.), Ltd., Johannesburg, South Africa. Request Bulletin 1266.

THE ATLAS CAR AND MANUFACTURING CO.

ENGINEERS AND MANUFACTURERS SINCE 1896

1140 IVANHOE ROAD **CLEVELAND 10, OHIO**

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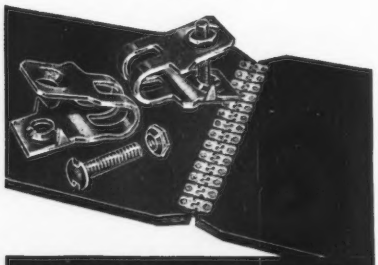
BELT FASTENER No. 500

FOR HEAVY CONVEYOR BELTS OF CHANGING LENGTH

These heavy-duty belt fasteners make a strong, flexible joint in conveyor belts, belts of any width and of from 3/8" to 1/2" thickness. They offer special advantages in mines, quarries or industrial setups where length or position of belt is frequently changed, because sections can be removed or added at will. Joints are opened for this purpose by simply pulling out the hinge pin.

Easily and quickly applied on the job or in the shop. Special design gives deep compression into belting and smooth, flush joint.

Write for Circular.



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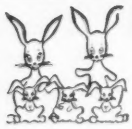

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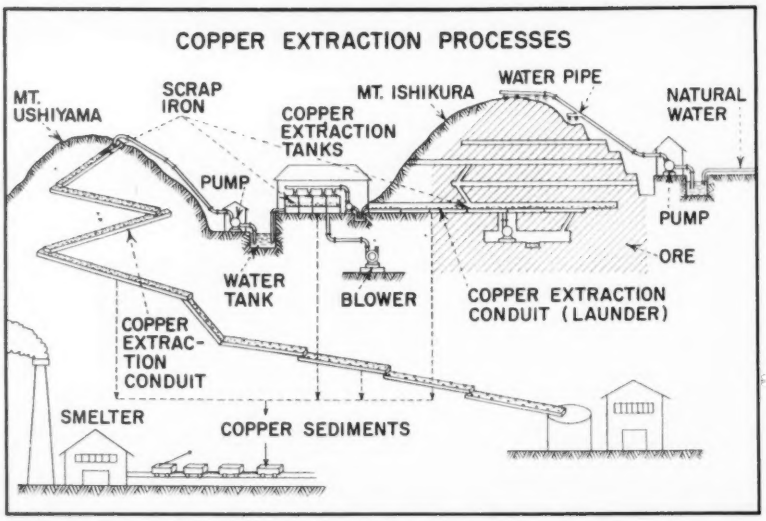


WATER POURED from the top of Mt. Ishikura seeps through mine, dissolves copper.

Dowa Waters Old Copper Mine—Profitably; 'Worn Out' Mine Yields 130 Tons Per Month

JAPAN'S DOWA MINING CO. is watering an old "worn out" copper mine at Kosaka—and making money at it.

Although of low mineral content, the old Kosaka Mine was operated during World War II, after which it was abandoned. Then it was discovered that seepage from the old workings contained 1.5g of copper per liter. At the suggestion of Dowa President Hidesaburo Kurushima, Dowa engineers experimented with artifical watering of the small mountain in which the mine rambles.

These experiments have resulted in the monthly production of 130 tons of 80% copper sediment at a cost which Dowa considers the lowest in Japan.

Water is pumped to the top of Mt. Ishikura where it is sprinkled into several hundred holes. The water seeps through the orebody and old workings to the fourth level where the liquid containing dissolved copper is collected in a launder and led from the mine.

Some of the liquid is collected at a lower level from which it is pumped to the fourth level launder. Old passageways and corridors have been blasted full to improve the efficiency of the copper dissolution from the ore. Copper content of the ore runs a little better than 0.3%, the estimated minimum concentration from which a profit can be made by this method, according to Dowa officials.

The sedimentation of the dissolved copper is accomplished by scrap iron in the launder and extraction tanks. It takes 1.8 to 2 tons of scrap, preferably tinplate, per ton of copper extracted.

Most of the copper sediment is recovered in the launder on the fourth level. This launder is 400 meters long. From the launder, the liquid passes through a series of scrap-filled extraction tanks, through which air is blown. Final extraction process is accomplished by allowing the liquid to flow through a long scrap-filled wooden conduit.

The sediment containing 80% copper is then processed in a rocking furnace at the Kosaka smelter.

A detailed discussion of Dowa's smelter at Japan was printed in *E&MJ* last January, beginning on p 72.

Zinc, Coal Firms Enter Uranium Field

NEW JERSEY ZINC CO. and Lehigh Valley Coal Corp. have joined the ranks of major companies who are expanding their interests to include uranium properties.

The zinc company has entered into an agreement with four mining firms in the Blind River District of Ontario under which it may acquire majority control of the companies, all of which have extensive interests in uranium.

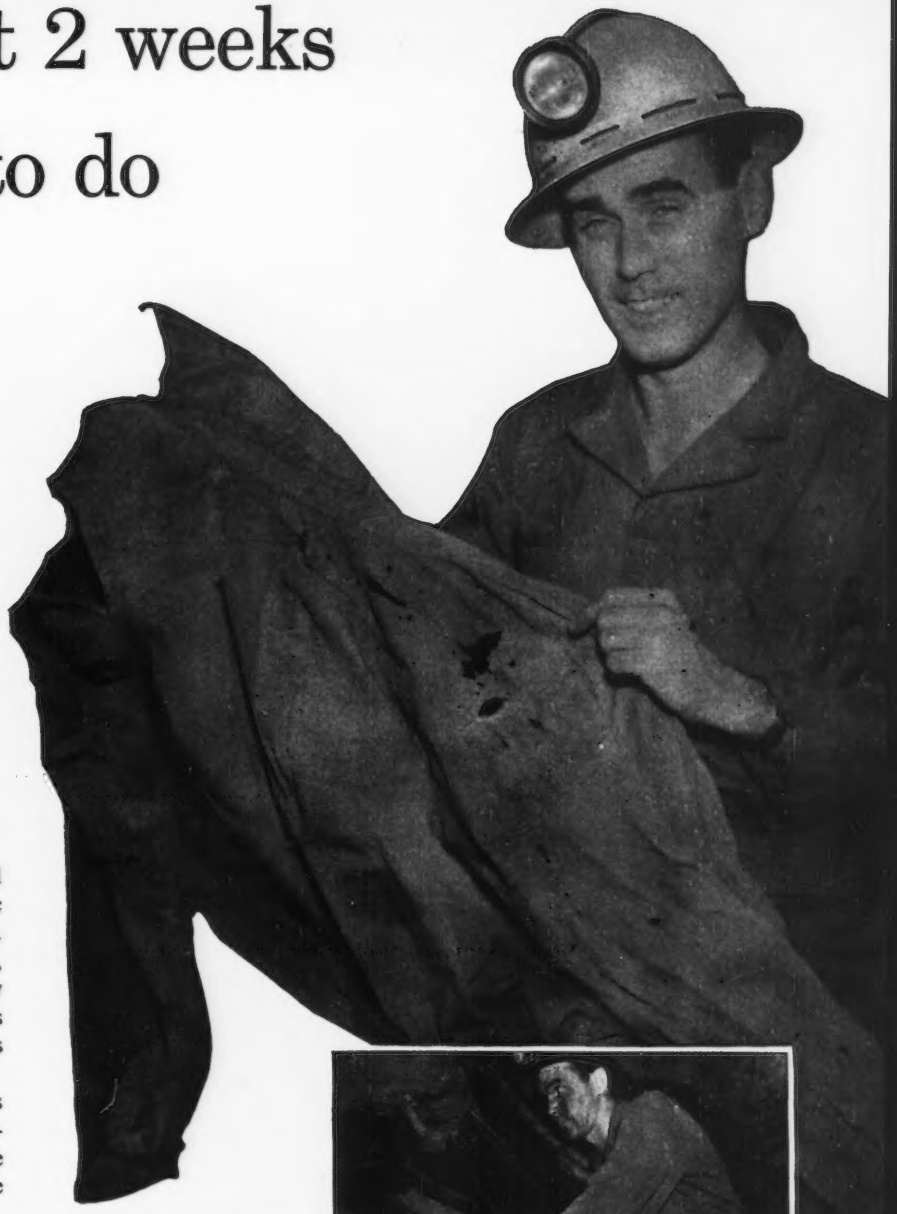
The four involved were listed as Big Game Mines Ltd., Gui-Por Uranium Mines & Metals Ltd., Moon Lake Uranium Mines Inc., and Calder-Bosquet Gold Mines Ltd., all of Toronto. Extensive exploration is planned.

New Jersey Zinc Co. announced also that it has applied for leases on the Colorado Plateau.

Meanwhile, the coal corporation had announced earlier that it has established an ore mining division for the acquisition and development of uranium and thorium properties. Negotiations were said to be in progress for properties on the Colorado Plateau, Utah, Wyoming, Florida, Canada and elsewhere.

"Here's what 2 weeks wear used to do before we switched to M.S.A. ChemKlos"

—says A. F. PARR
Engineer
Mountain Copper Company

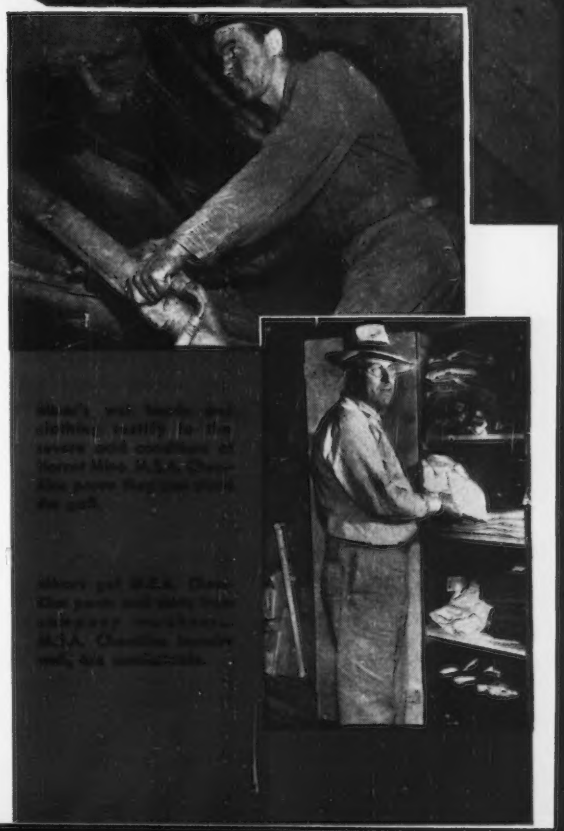


Iron pyrite ore, through action of ground water, is partially reduced to sulphuric acid . . . diluted but still powerful-acting. This acid, although harmless to the body, caused ordinary work clothes worn by miners at Mountain Copper Company's Hornet Mine to fall into half-rotted shreds in two weeks' time, and often less.

Company officials investigated methods of waterproofing and acid-proofing ordinary work clothes, but discontinued the treatments because they did not prove sufficiently effective.

When M.S.A. ChemKlos were introduced, Mountain Copper saw a possible answer to their problem. Service life of the purchased M.S.A. ChemKlos, now worn by most of the men working underground, proves that they were right. *ChemKlos last about ten times longer than the old, short-lived clothing.*

The reasons for the longer life of M.S.A. ChemKlos are the combination of a new fabric, Dynel, which resists acids and caustics, and a special weave that gives improved abrasion resistance. M.S.A. ChemKlos are made of Dynel throughout, and are tailored for comfort, ease of movement, and style. They are available in shirts, trousers, and coveralls. Write for details.



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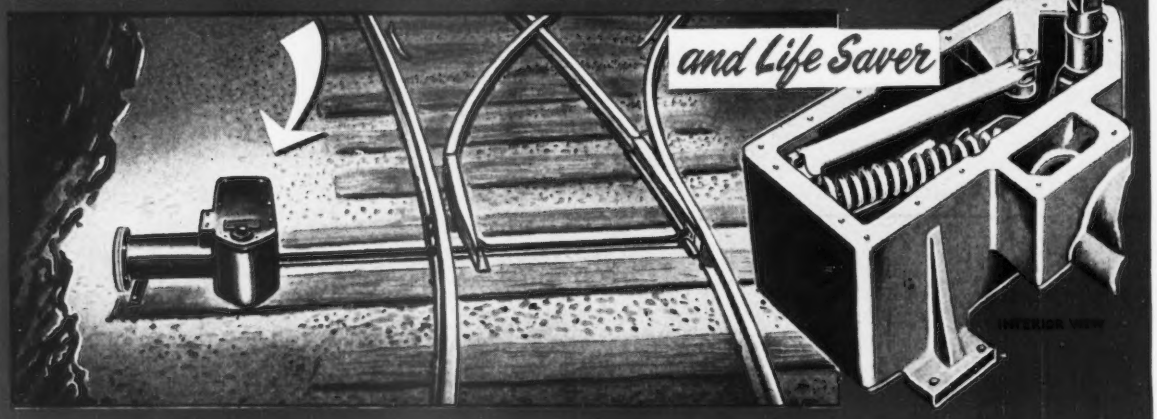

Safety and *Efficiency* are musts for every transportation system. Eliminate the hazardous practice of men jumping off and on moving trips . . . reduce delay stops to the minimum.

"Canton Electri-throw" sends trips through at *full speed for profit . . . saves lives for profit.* Write for a Canton representative to show you where a "Canton" may save a life and *will make a profit.* When writing please use street and zone numbers.

Manufacturers of products that pay for themselves quickly: Car Transfers; Rock Dusters; Track Cleaners; Automatic Doors; Cable Splicers.

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HAS RIB-CONE MILLS FOR ALL GRINDING OPERATIONS

More than 100 sizes and types of ball mills. 40 years of experience in supplying every conceivable grinding requirement is at your disposal in the form of engineering counsel. *An inquiry to our engineering department will bring a prompt reply.*

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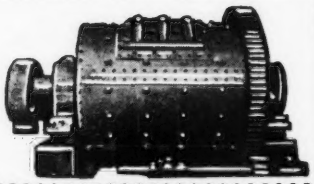
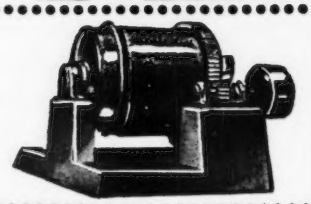
SECTIONALIZED MILL

Completely assembled in our shop, then marked and knocked down for shipping "Anywhere a Mule Can Go."



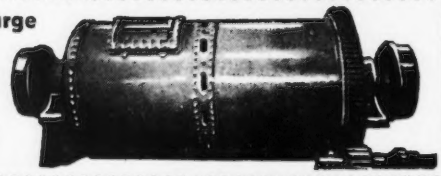
SCREENING MILL

Most economical type. Particularly suited to amalgamating and concentrating classes of ores. Capacity from 2 to 95 tons per 24 hours.



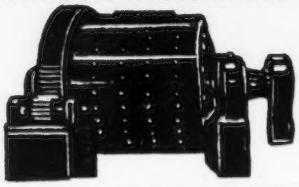
Peripheral Discharge MILL

Particularly suitable for producing a granular product. Designed for controlled grinding of tungsten and similar ores where sliming must be eliminated.

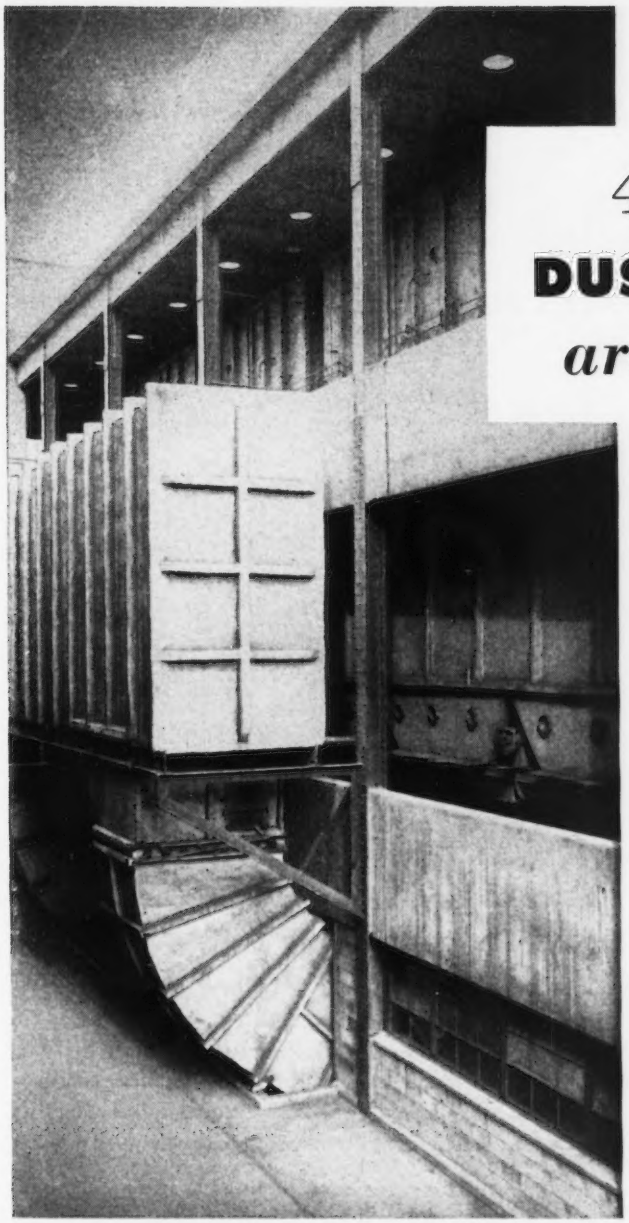


LOW PULP LINE MILL

One of the new Champion Series. Available in low pulp line, plain overflow, screening and convertible types with capacities ranging from 25 to 250 tons per 24 hours.



More than 100 Sizes and Types of RIB-CONE Ball Mills



Consolidated Mining and Smelting Co. uses these Dustube Collectors in their Trail, B.C. operations for filtering valuable lead oxide from 250,000 c.f.m. of lead blast furnace gases at 215° F.

4 reasons why **DUSTUBE® collectors** *are your best buy*

1. UNIFORM RECOVERIES APPROACHING 100%

of the fume entering the Dustube cloth type collector are commonplace. It is the most dependable method of dust removal that will insure a "clean stack" under wide variation in operating conditions.

2. HANDLES HOT, CORROSIVE GASES

A fundamental approach to cooling equipment design plus a wide selection of filter fabrics, including new synthetics, has increased the scope of cloth filtration. Gas at initial temperatures as high as 2000° F. can be economically cooled and filtered at temperatures well above the dew point.

3. RUGGED SIMPLICITY, ECONOMICAL OPERATION

Dustube Collectors have the inherent capacity for continuous, severe service with a minimum of down time. Automatic units can be designed to permit interior inspection and maintenance without shutting down. Capital investment and operating costs are very reasonable.

4. APPLICATION ENGINEERED

Dustube Collectors are available in either standard units or they can be individually designed to fit existing or new plant buildings and flue lines. Collected material can be automatically discharged and conveyed to a common point for reprocessing without dewatering, filtering or drying.

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40 page catalog

contains practical charts and useful engineering data. Write today for your free copy of Catalog 72-B.

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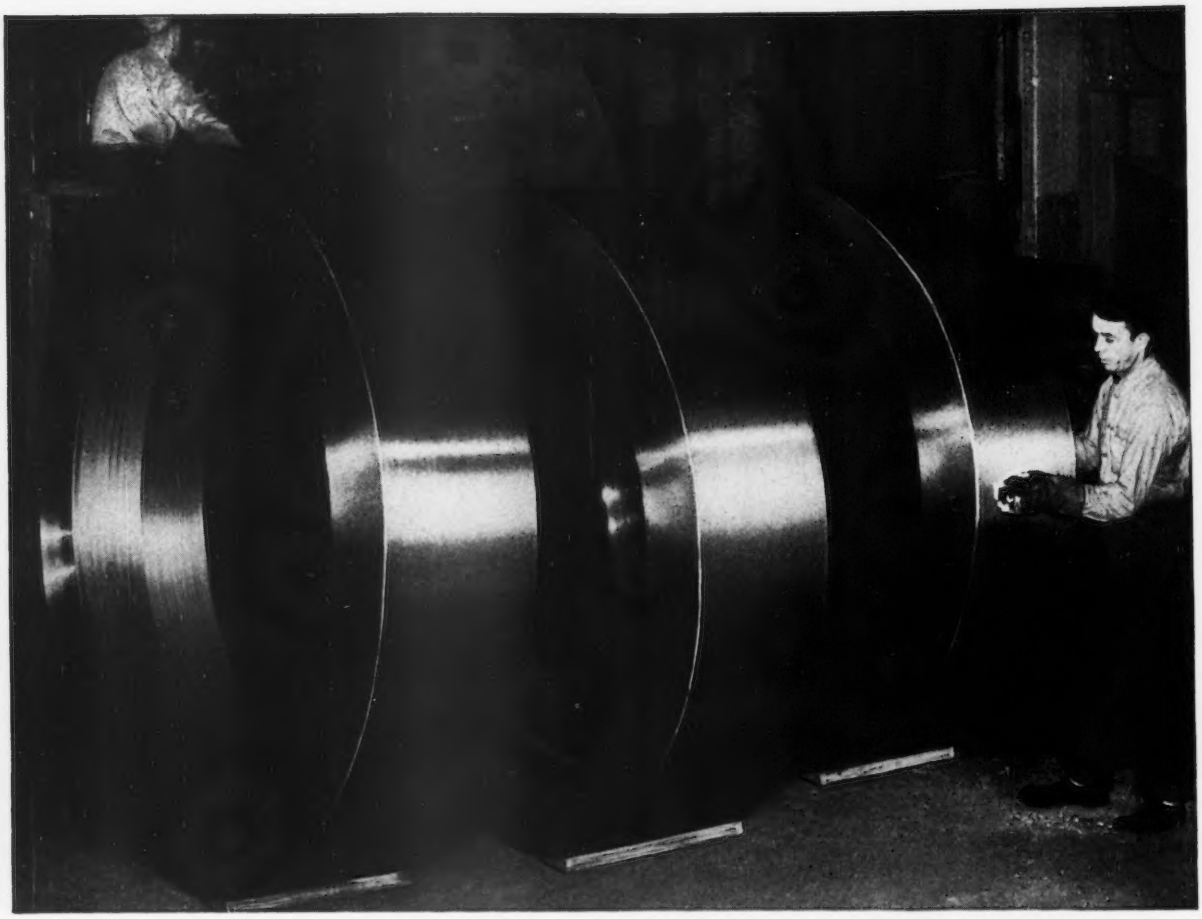
dustube® COLLECTORS



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Tougher, higher resistance to abrasion that "goes down deep" to provide longer service . . . cuts your cost per ton crushed — that describes Midvale Roll Shells.

Midvale Roll Shells combine maximum toughness with remarkable freedom from breakage, and plenty of "bite." Their manufacture is controlled from the ingot to the final machining in Midvale's own plants. We make and shape our own steel for roll shells to stand up and take the toughest wear. The performance records of Midvale Roll Shells in leading mines, smelting companies and quarries prove it.

Bring your roll shell and other machinery maintenance problems to Midvale. Let us recommend the best material to save you costly breakdowns . . . to lower your cost per ton crushed.

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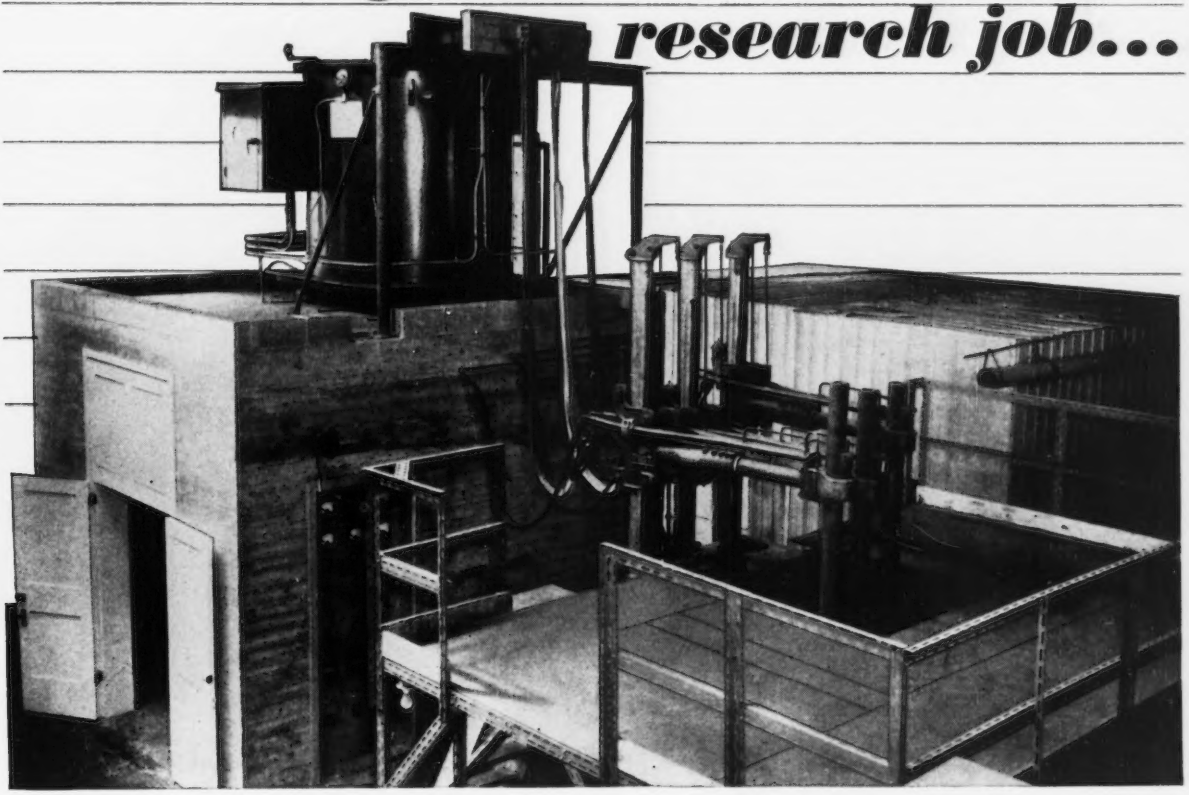
FORGINGS, ROLLS, RINGS, FLANGES, STAINLESS STEEL CASTINGS

*Lectromelt** goes to Canada on a research job...



...Department of Mines & Technical Surveys installs 200KVA Lectromelt Furnace for experimentation

Cheap electric power and plentiful mineral resources have led to Canada's exploration of the economies and efficiency of electric smelting. A laboratory has been set up to test high temperature smelting and to determine whether more desirable products can be obtained more practically by using electric furnaces.

Highly satisfactory results already have been obtained in test production of ferroalloy-type material, according to the Division Chief heading the laboratory.

It is anticipated that certain ores will be smelted experimentally to obtain informative data on costs and chemical reactions encountered. Also, the smelting problems of various refractory materials will be investigated.

Expectations are that the cost of the pilot laboratory will be insignificant compared with the economies and material improvements that will result from this Canadian research. Perhaps you could benefit similarly by installing comparable research facilities.

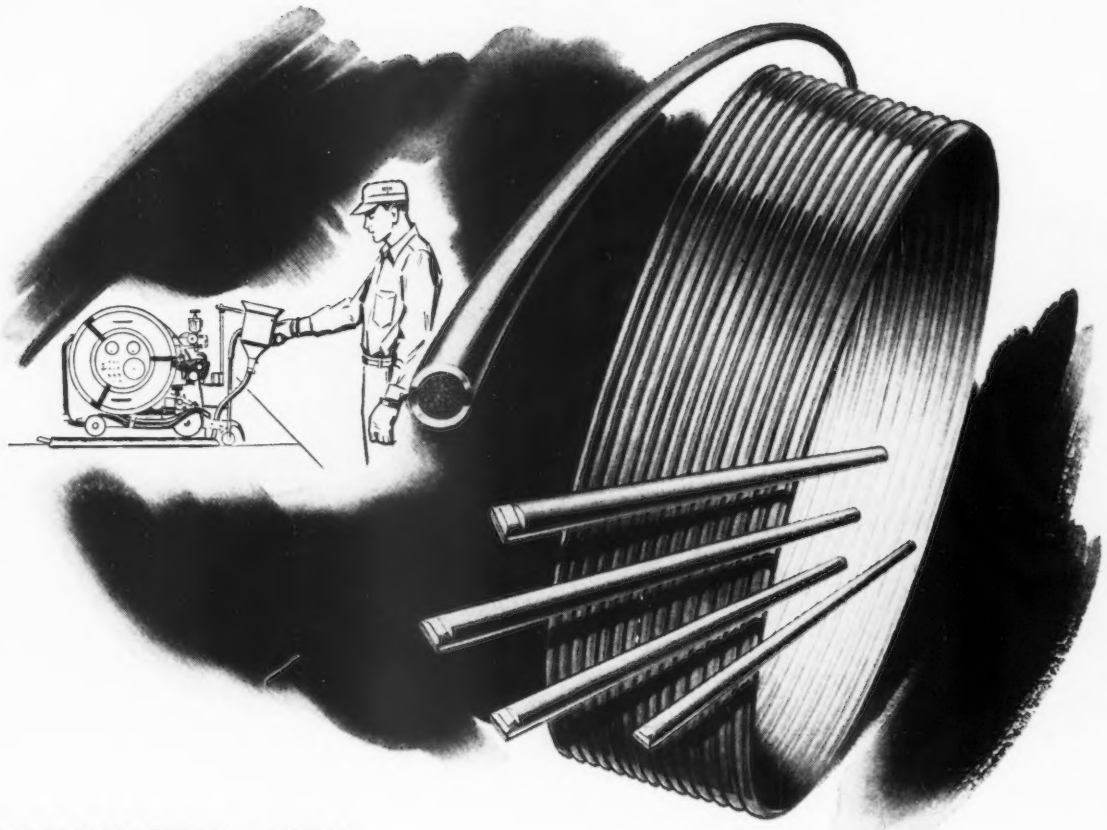
Lectromelt Furnace engineering assistance is always available to you. Write on any problem. Also write for Catalog No. 105 which describes many types of Lectromelt Smelting and Refining Furnaces, and their versatility. Pittsburgh Lectromelt Furnace Corporation, 322 32nd Street, Pittsburgh 30, Pennsylvania.

Manufactured in . . . ENGLAND: Birlec, Ltd., Birmingham . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa. JAPAN: Daido Steel Co., Ltd., Nagoya

MOORE RAPID

WHEN YOU MELT... *Lectromelt*

*REG. T. M. U. S. PAT. OFF.



HAYNES 90 alloy now available in tubes and at a MUCH LOWER PRICE

TRADE-MARK

Now you can save even more by hard-facing wearing-parts with HAYNES 90 alloy. This is because HAYNES 90 costs so much less in this new economical tube form. These new tube rods produce sound, uniform deposits that won't crumble or flake off at temperatures up to 1000°F. They provide the same high abrasion, impact, and corrosion resistance—the same dependable protection for your equipment that HAYNES 90 brought to you as a cast rod—and at a much lower price.

For manual hard-facing, HAYNES 90 tube rod comes in convenient 14-in. lengths for easy application with standard metallic-arc welding equipment. For rapid coating of large parts, HAYNES 90 also comes in coils for mechanized hard-facing by the submerged-arc, inert gas, and open-arc methods.

HAYNES 93, HASCROME, and HAYSTELLITE alloys are also available in this economical tube rod form. HAYNES 93 iron-base rod is noted for high abrasion and corrosion resistance . . . HASCROME iron-base rod for high impact resistance . . . and HAYSTELLITE tungsten carbide rod is tops for resistance to severe abrasion.

Your local dealer carries a complete line of HAYNES hard-facing rods. Contact him for complete details. If you don't know the location of your local dealer, write to Haynes Stellite Company, a Division of Union Carbide and Carbon Corporation, Kokomo, Indiana.

See... Your local Haynes Stellite Dealer

or

Write... to Haynes Stellite Company

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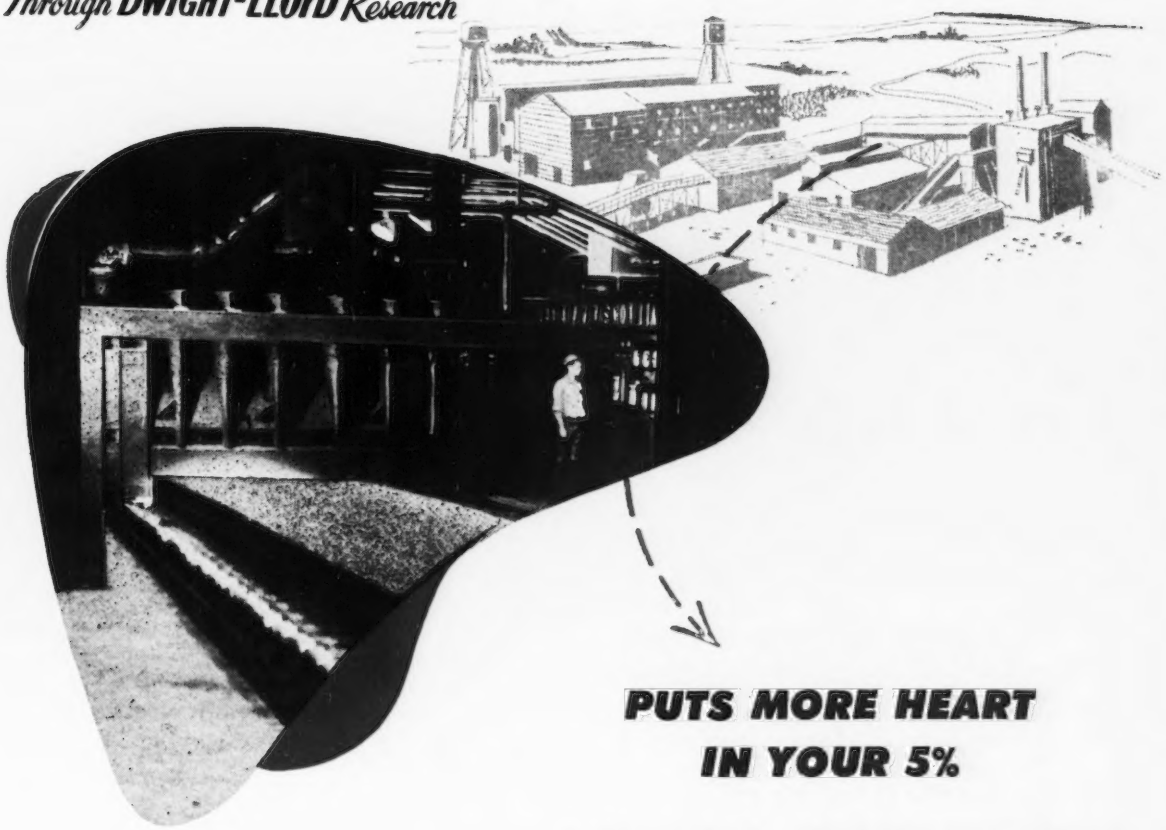
Revolution in Sintering
Through **DWIGHT-LLOYD** *Research*



PUTS MORE HEART IN YOUR 5%

Getting a good sinter, at low cost, is more dependent *on the sintering machine* than any other part of the plant installation. Yet this vital heart of the installation represents only 5% of your plant investment.

The new Dwight-Lloyd machine was designed to add even greater value to this important 5%. It incorporates many engineering advances which improve the sinter quality and reduce production costs. With these features, the Dwight-Lloyd machine is establishing new standards for output and quality.

The constant improvement of the Dwight-Lloyd machine has been the objective of years of research by our engineers. That's why it represents the finest in modern, economical sintering.

Write for detailed information on the new Dwight-Lloyd sintering machines.

FEATURES OF THE NEW DWIGHT-LLOYD MACHINES

ROWEN WINDBOX SEAL* — completely eliminates air leakage between pallets and windbox, resulting in a more uniform product, greater production and lower operating costs.

COMPOUND DISCHARGE CURVE* — eliminates spillage, controls pallet drop, reduces pallet wear.

UPPER WINDBOX — permits up-draft or down-draft operation, adding great flexibility to installation. Can be used to recirculate hot gases, reducing fuel requirements for the charge and also lowering plant heating costs.

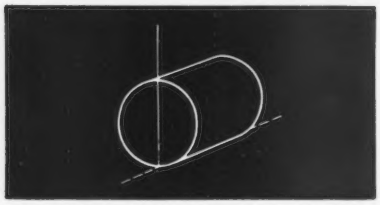
ROLL FEEDERS — assure an even distribution of charge on pallets.

*Patented

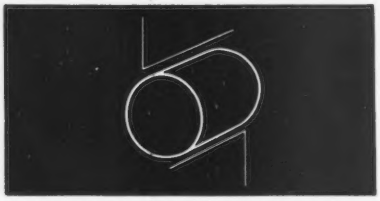
DWIGHT-LLOYD, Inc.
DIVISION OF SINTERING MACHINERY CORPORATION
120 SINTER AVENUE · NETCONG, NEW JERSEY

Rollways ROLL right because they're MADE right

RIGHT ANGLE DESIGN
increases bearing efficiency



RIGHT-ANGLE ROLLER ENDS . . . precisely square to avoid end rub, oscillation and side-shock.



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RIGHT-ANGLE SEPARATOR SLOTS . . . precisely machined to prevent roller skew, slide and uneven wear.

Line for line and surface for surface, each maximum-load type Rollway Bearing is a striking example of right-angle trueness. The straight, solid cylindrical rollers provide maximum contact area in any given dimension. You get full load-carrying capacity and greater ability to absorb shocks, vibration and overload.

The net result is smoother running, longer life, reduced service cost, and less down-time due to bearings.

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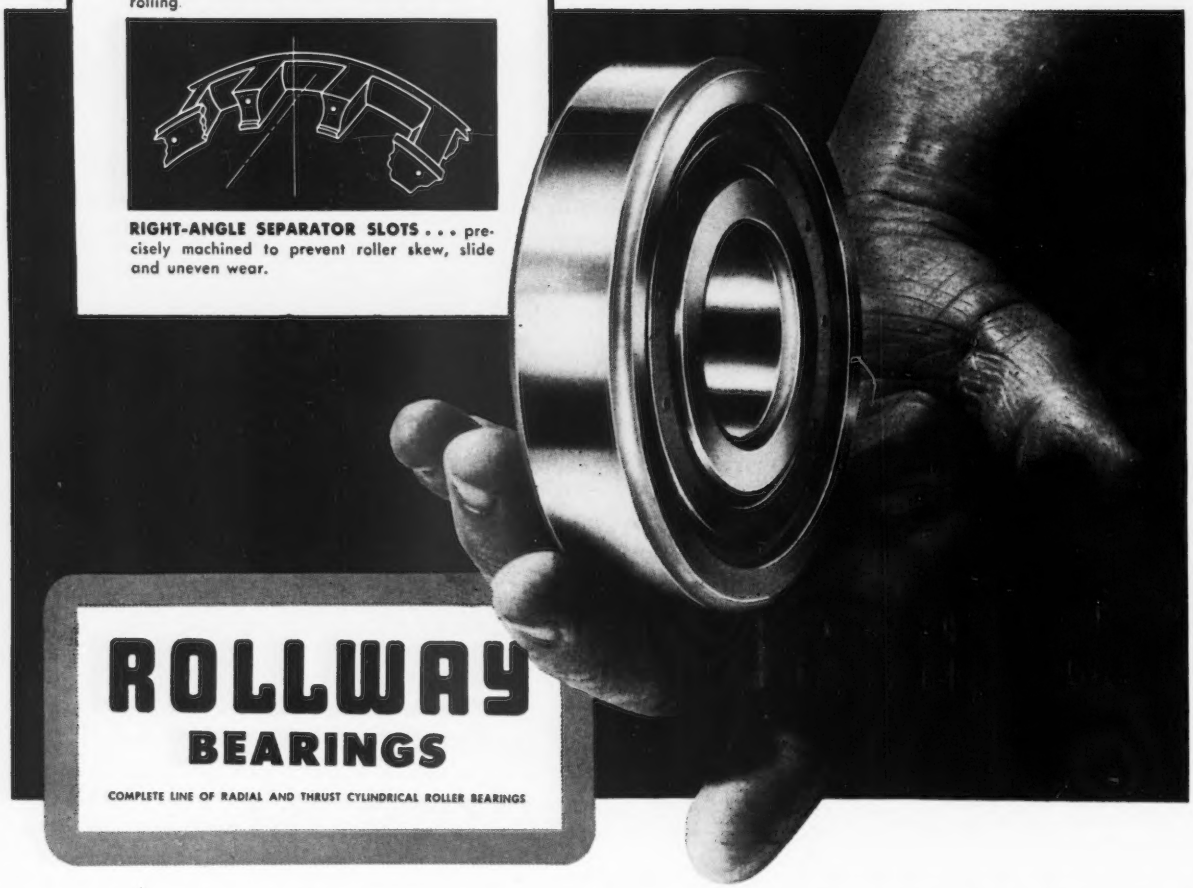
● Our engineers will gladly work with you on your bearing problems. Confidential consultation. No charge — no obligation.

Rollway Bearing replacements are available through authorized distributors in principal cities. Consult your classified phone directory.



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IMPOSSIBLE WITHOUT EXPLOSIVES

120 million tons of iron ore, it is estimated, were mined in open pits and underground operations last year. This photograph shows some of the highly mechanized operations which make such huge production possible.

But before the ore can be dug, millions of pounds of explosives are used to break it loose from working faces, to assure easy shovel digging and rapid transportation of the ore to the crushing and washing plants.

The manufacture of explosives and the knowledge of their efficient and economical use have been Hercules business for 40 years. During this time we have studied the varying conditions under which explosives are used and have pioneered in developing the right types of explosives for industrial needs. Hercules explosives and services assure economical and efficient blasting not only in metal mining, but in coal mining, quarrying, construction—in fact, wherever explosives are used.

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XR54-1

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Birdsboro-Buchanan jaw crushers give you a *deeper frame* that provides maximum closure to increase the amount of reduction in primary crushing operations. The result is greater reduction in *large* volume at *lower* cost.

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This 66" x 84" Birdsboro-Buchanan all-steel primary crusher, biggest deep frame crusher ever built, is a good example. Set for 10½" discharge, it is capable of crushing 1000 tons per hour.
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The Industrial Brownhoist heavy-duty Diesel electric full revolving pile driver illustrated here is the first ever built. Maximum leader load is 26,000 lbs. Reach is 34' 1" from center of rotation and 20' 6" ahead of the front axle. Power battering leaders 50 feet long have a batter of 3 inches per foot. The leaders can be raised to driving position or lowered to traveling position in just one minute. Top travel speed is 20 m.p.h. with a maximum drawbar pull of 21,000 lbs. It can haul its own work train and is equipped with air brakes for braking the driver as well as the cars it is hauling.

Brownhoist also builds Diesel Electric Locomotive-Cranes in capacities from 25 tons up, Railroad Wrecking Cranes in capacities to 250 tons, boat unloaders, traveling bridge cranes, fast plants and other special equipment for handling bulk materials fast and efficiently in mines, railroads, docks and large manufacturing plants. For complete information about Brownhoist equipment to speed up your heavy materials handling, consult your nearest Brownhoist representative or write us today.

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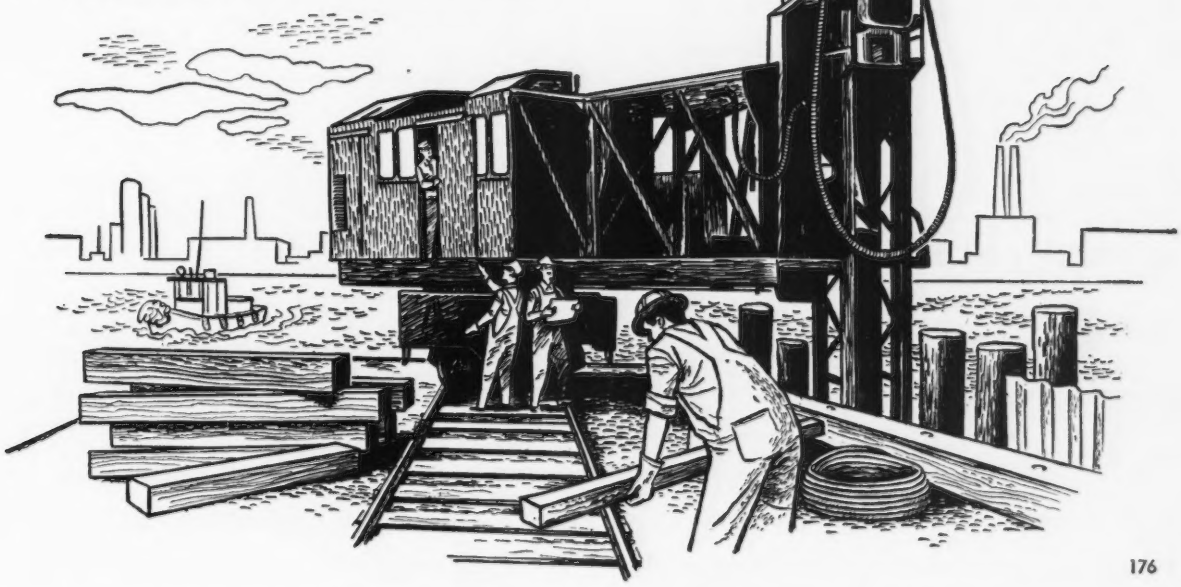

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In a real sense, this is another FIRST for Oliver United for these filters pioneered the filtration phase of the intensive drive for uranium all over the world. Two factors were largely responsible for this clear-cut preference of Oliver Filters:

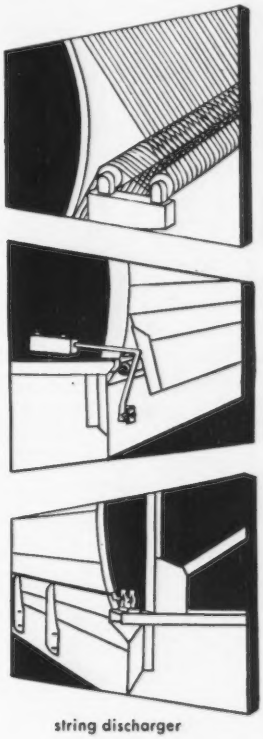
a • • • Oliver United, as a filtration engineering firm in business since 1907, showed by far the broadest knowledge of and experience with the filtration of ores.

b • • • Oliver United, as a manufacturing firm, showed by far the widest selectivity in filter types, thus assuring operators they would get filters that would do the best work.

Perhaps this strong preference for Oliver United equipment and services on the part of those milling uranium ores will suggest where you can get the best in filters, regardless of kind of ore or tonnage to be handled.

• • •

While both wire wound and panel type Oliver Filters are being used today, the trend in filter selection is now strongly toward the Oliver Panel Filter (shown above) not only because of the ease with which cloths can be changed but even more important because it can readily handle thick or thin cakes. The Panel Filter lends itself to several different types of cake dischargers: taut suspension wire, string, and counter-balanced, swinging scraper.



string discharger

counter-balanced, swinging scraper

taut suspension wire discharger

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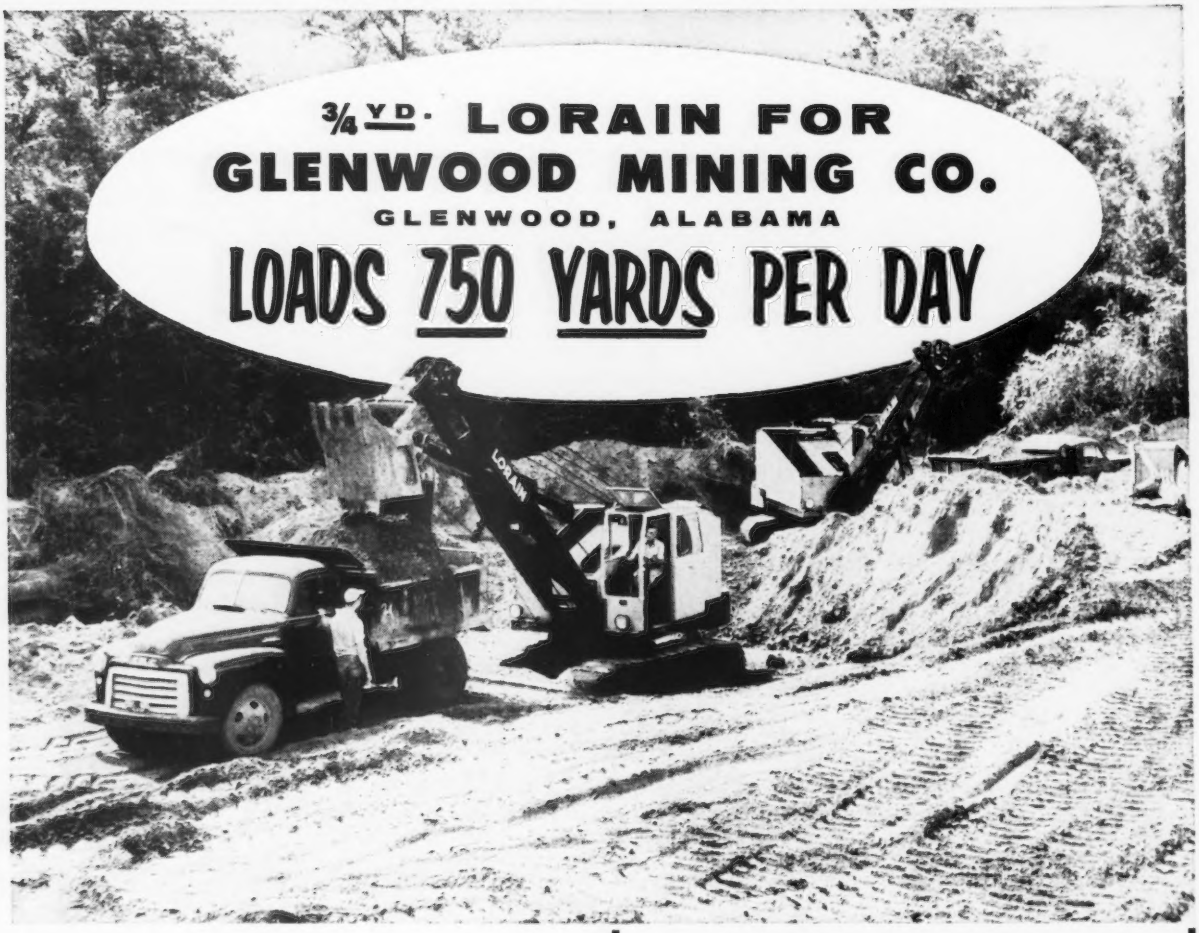

Twice the Glenwood Mining Co., Glenwood, Alabama, have made Lorains their choice. Secretary-Treasurer D. Foust Jackson enthusiastically says—*"We are crazy as hell about them!"* Performance of Lorain No. 2 is typical of the results that keep them sold on Lorains. This ¾-yard shovel, model TL25-K, is averaging 750 yards per 10-hour day, keeping five-yard trucks busy on a 3½ mile haul. Material is iron ore, in veins 50 ft. wide and about 9 ft. thick, running from out-croppings to 9 ft. to 12 ft. below the surface. The Lorains remove sand and clay overburden, then load out ore into trucks for transportation to the mill.

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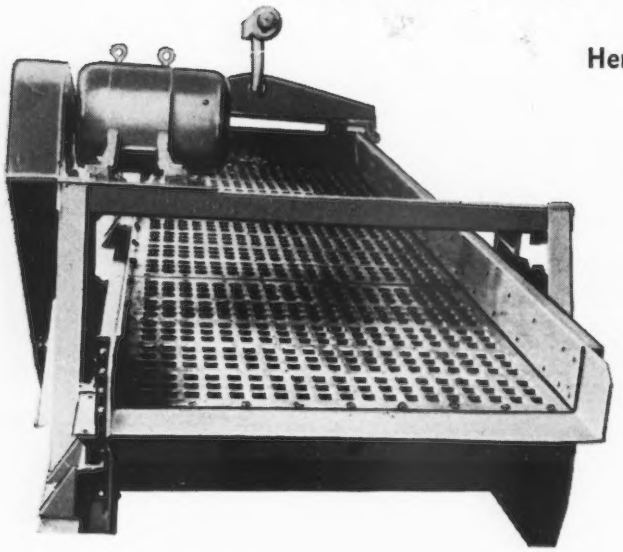

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Inside story of

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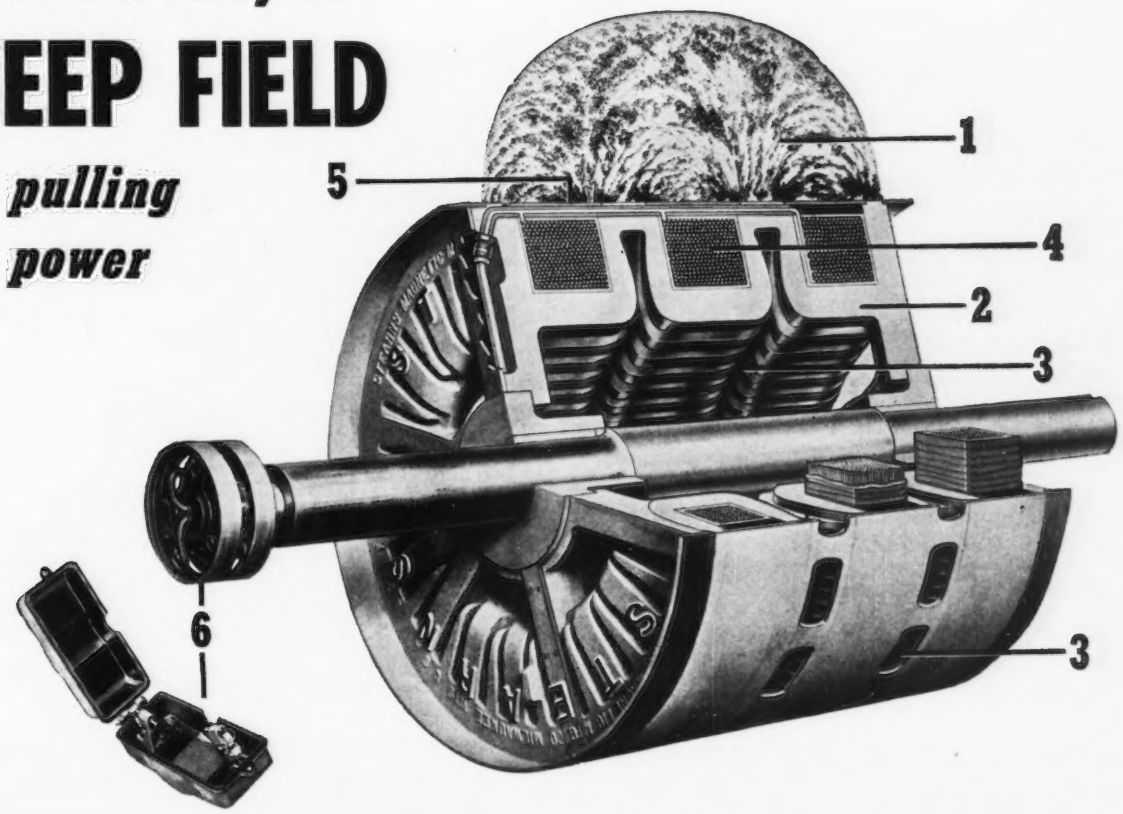
pulling power



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Here you can see at a glance why powerful Stearns electro-magnetic pulleys effectively remove tramp metal from conveyor lines even though material flow is fast and belts are heavily loaded.

Check these six big features:

1. **Magnetic Field.** Deep, strong, magnetic field provides maximum pull when tramp metal is trapped between large pieces of bulk material.
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Magnetic Pulleys of the permanent magnet type also available where indicated or desired. Write for descriptive catalog 303B.

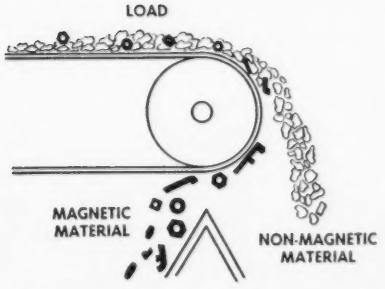

Diagram showing how Stearns magnetic pulley removes tramp iron.

1065

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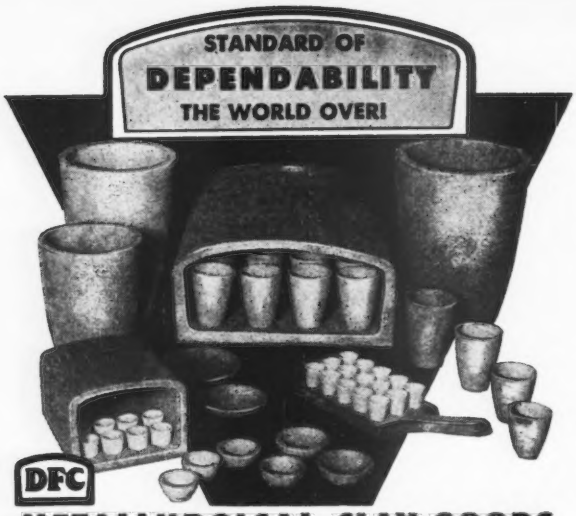

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(Continued on opposite page)

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(Continued from opposite page)

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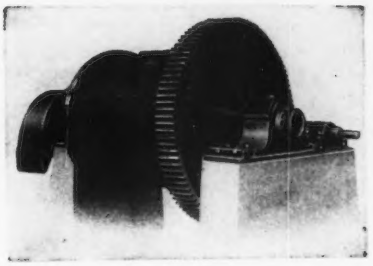

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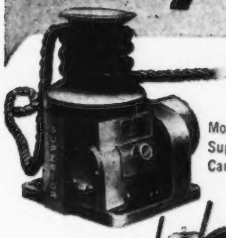

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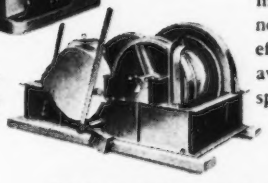

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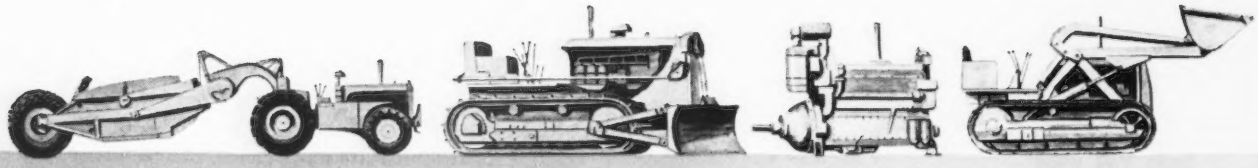

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Whether you want one machine, a few, or many, your Caterpillar Dealer is your best source of new and used equipment. He posts a bond only on used Caterpillar-built equipment because he can count on—and *you* can count on—the traditional ruggedness and long, trouble-free work life of these husky yellow machines. See him for full details on this *exclusive* across-the-board guarantee. Do it today, while his selection is at its peak!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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Only your Caterpillar Dealer offers a $10,000 bond on used equipment

Your Caterpillar Dealer offers you three clear-cut classes of used equipment. He backs each one in writing. You buy with confidence, sure that the equipment is honestly described. See him for the best values on the market!

(1) "BONDED BUY." Only the best in used Caterpillar-built equipment. Each "BONDED BUY" machine is backed by a Dealer's Guarantee Bond equal to the purchase price of the machine up to a maximum of $10,000. This provides a guarantee for thirty days against unsatisfactory performance due to defective parts. If a part should prove defective within the guarantee period under the normal conditions of your job and with proper maintenance, your dealer will put your machine back into operating condition *with no charge to you for parts and labor* up to the amount of the bond. The Dealer's Guarantee Bond is backed by The Travelers Indemnity Company. Your Caterpillar Dealer gives you this protection, at no cost to you, with your purchase of a "BONDED BUY" machine. Look for the "BONDED BUY" symbol —your assurance of the best in used equipment.

(2) "CERTIFIED BUY." This is your next best buy in used equipment. "Certified Buy" covers machines of any make in good condition. Your performance guarantee is in writing backed by your Caterpillar Dealer.

(3) "BUY AND TRY." Bargains in used machines of any make. Buy and try them for a period mutually agreed upon by you and your Caterpillar Dealer. "Buy and Try" machines carry his written "money-back" agreement.

"BONDED BUY" ***assurance effective in the United States and Canada***

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ROCK RATED

before it ever reached the pit!

Look at the development behind the P&H Model 1055 and you see why this 3½-yd. shovel can outproduce machines of greater rated capacity.

It's the one rock shovel built completely from progressive ideas. P&H was first with the added strength of welded steel construction . . . the pioneer in better weight distribution to let you use full digging power at tooth point . . . the leader in cushioned hydraulic control. And it's P&H with revolutionary Magnetorque* that swings you through a faster, smoother cycle in any kind of weather. Count on *15% additional rock production* from this P&H advancement alone!

There's a companion P&H 955A Shovel in the 2½-yd. class equally as outstanding. Write today for further facts about either model.

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Lasts the life of the machine!

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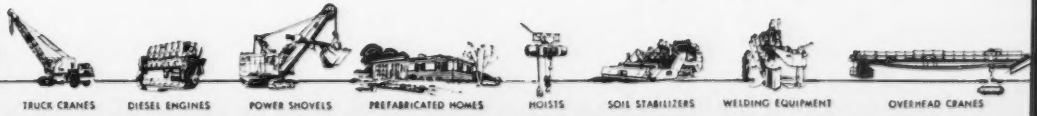

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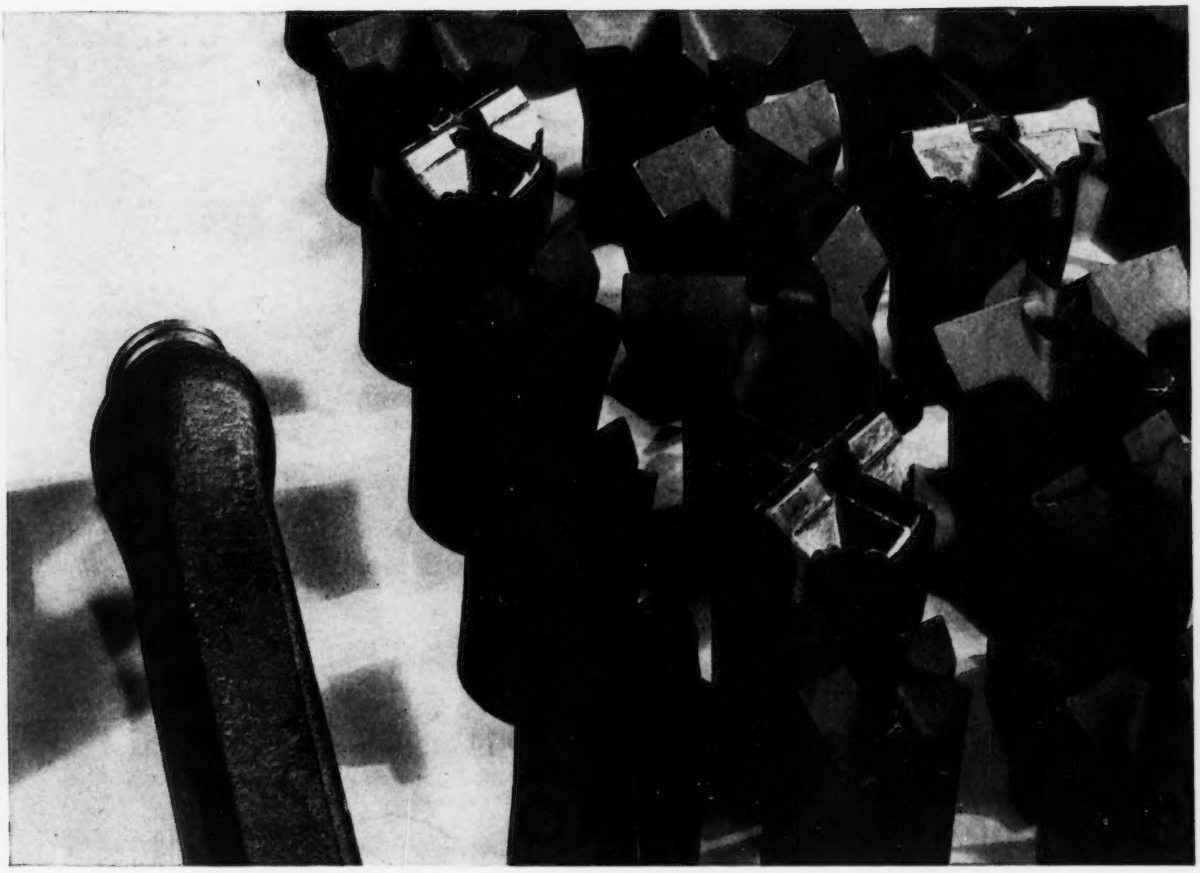

Both TIMKEN® rock bit types are interchangeable on the same drill steel!

WHY should your drillers waste valuable drilling time going after a different set of drill steels every time they need a different type of rock bit? Timken® multi-use and carbide insert bits eliminate this costly delay, because dozens of them fit the same threaded drill steel! It takes just a minute to unscrew one type of Timken bit and screw on another different bit—right on the same steel, right on the job!

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Both Timken multi-use and carbide insert bits are made from electric furnace Timken fine alloy steel. And their special shoulder unions keep drilling impact from damaging threads.

Our rock bit engineers will be glad to help you with your drilling problems by analyzing your operations. They're experts at cutting drilling costs. There's no obligation. Just write to: The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

WHERE YOU CUT COSTS WITH TIMKEN MULTI-USE BITS

Most economical for ordinary ground. With correct control and reconditioning, they give lowest cost per foot of hole when full increments of steel can be drilled.

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Give highest speed through hard, abrasive ground. Also most economical for constant-gage holes, small diameter holes, very deep holes.

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